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DISRAELI KOBAK, M.D., Editor

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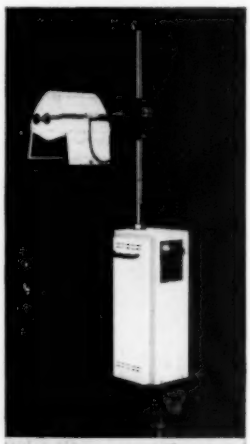

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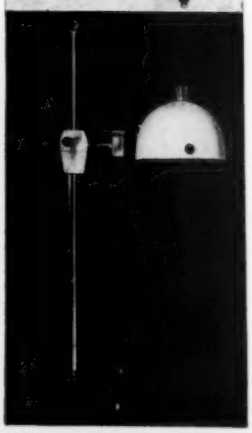

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INTRAVAGINAL TREATMENT OF PELVIC INFLAMMATION BY CONTROLLED SUPERHEATED AIR *

Preliminary Report

FREDERICK H. FALLS, M.D., LOUIS B. NEWMAN, M.D.,
and
DISRAELI KOBAK, M.D.

CHICAGO

The following report pertains to a new method of therapy by the intravaginal application of superheated air. It is based on the clinical results obtained in 71 patients with chronic inflammatory processes of the pelvic organs.

The value of heat in the treatment of pelvic inflammation has long been recognized, having been used in various forms for centuries. As early as the fifth century, B. C. Hippocrates recommended hot vaginal douches for the relief of pelvic pain. However, for many years to follow there were no important changes in the method of applying heat to the pelvis until the seventeenth century, when as related by Holden and Gurnee,[1] German physicians advocated the application of heated lead shot poured into the vagina in order to secure prolonged heat and distention of the vaginal cavity. This produced greater distention than is possible by the vaginal douche, but there was the danger of burns due to the pressure exerted by the lead shot combined with the action of the heat. Next there followed the intrauterine douche, but this method also proved harmful, and again many centuries elapsed before the vaginal douche came into its own. In the last few years its use has been greatly increased in scope.

Gellhorn[2] obtained excellent results in pelvic inflammation by prolonged vaginal douchs at temperatures probably higher than those used previously. In 1923, he recognized that the vaginal mucosa could tolerate higher temperatures than the vulva and the perineum. By protecting these structures with a thick layer of vaseline he was able to use several gallons of water at temperatures up to 120 F. However, this method had certain practical limitations.

A definite advance in the application of heat to the pelvis was devised by Elliott when he introduced a thin rubber bag into the vagina through which heated water is circulated by a pump. By this method the vagina becomes distended and the heat is distributed to the surrounding tissues. While this appliance proved satisfactory in many cases, there are reports that it possesses certain drawbacks. It is a fact that the rubber bag often bursts resulting in the escape of hot water and causing burns, scalds and sloughs, which obviously renders this procedure one fraught with risks.

It is generally known that poor health in women is frequently due to pelvic inflammatory disease with its associated pain, menstrual irregularities, backaches, leukorrhea, nervousness, and the like, and that the pain of the majority of patients can be alleviated by the application of pelvic heat. For this particular purpose one of us (L. B. N.[3]) devised an improved method of therapy,

* From the Departments of Obstetrics and Gynecology, University of Illinois College of Medicine; the Gynecologic and the Physical Therapy Services, Cook County Hospital.
* Read at the Eighteenth Annual Session of the American Congress of Physical Therapy, New York City, September 6, 1939.

which will be shown to obviate the objections to any of the methods now in vogue.

Description of Apparatus

By utilizing air as the heating medium, we found a simple, safe and effective method of introducing heat into the vagina. Heated air is circulated through a special shaped thin rubber bag, which is inserted into the vagina and then inflated with air by a rubber bulb similar to that used on blood pressure apparatus, so as to gently distend the vagina. This brings the rubber bag into proper contact with the tissues, because all of the folds have been flattened. This results in the heat being uniformly conducted over a large area to the surrounding tissues (fig. 1).

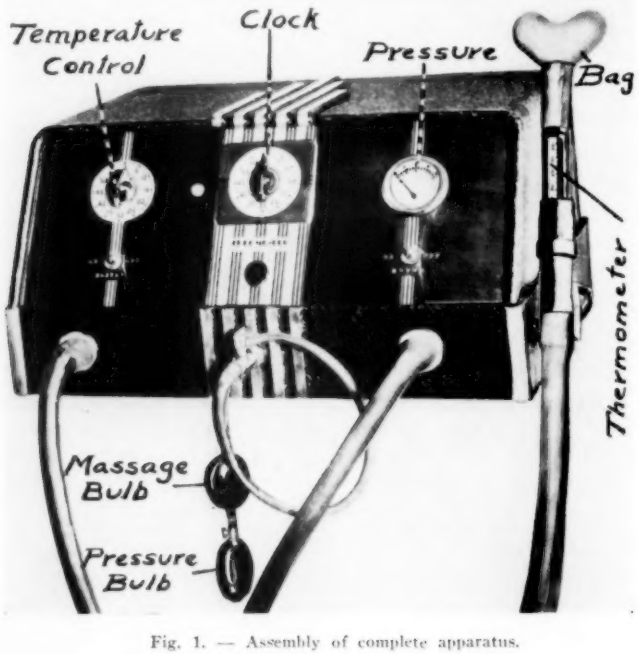

Fig. 1. — Assembly of complete apparatus.

The heated air is continuously circulated through the bag by a small motor-driven fan producing a uniform temperature throughout and an even distribution of heat, the air being heated by a small electrical unit. The maximum tissue temperature is never higher than the temperature recorded by the thermometer which extends into the bag. Temperatures up to 130 F. are used, automatically controlled by a thermostat for any desired range.

The pressure within the bag is approximately 1 to 1½ pounds and is indicated on a pressure gauge in the apparatus. An automatic clock also is incorporated so that the treatments can be timed for any desired period. The majority of our treatments were given for 45 minutes. When the bag is distended with air, the pressure on the tissues is uniform over the entire surface. It is of interest to note that the weight of the bag and its contained air is negligible, being less than one-quarter of an ounce.

The weight of the air in the bag represents a decided advantage over one distended with water, because in addition to the pressure exerted by the latter there is extra weight on the tissues adjacent to the under surface equal to the weight of the water in the bag. This is approximately one-half pound, depending on the amount of distention. Since the circula-

tion of inflamed tissues is already impaired, this additional pressure tends to compress the capillaries and interfere with the blood supply through the adjacent tissues, and this combined with the heat used may lead to necrosis. The added pressure by the weight of the water also causes discomfort, and produces a disagreeable sensation as the treatment progresses. This discomfort often arises even before the bag is fully distended. Inflamed tissues are commonly very sensitive to pressure, weight or manipulation.

In contrast, treatment with our apparatus utilizes a bag filled with air heated at a definite temperature, during which there develops uniform heat in the pelvis without any uncomfortable sense of pressure or weight. Even if the bag should become torn during a treatment, the patient will not be burned, as the bag merely collapses and there is no escape of hot air. Furthermore, a double sealed sleeve is attached to the applicator so that torn bags can be easily and quickly replaced (fig. 2).

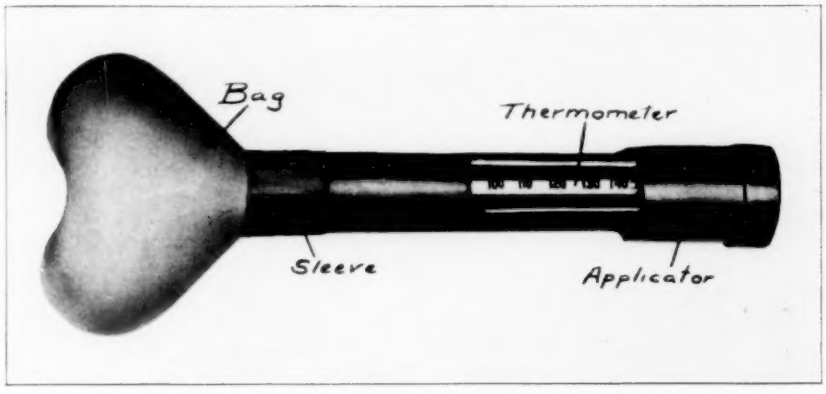

Fig. 2. — Applicator assembly.

The apparatus has the further advantage that when the applicator is removed, it may serve as an excellent source of dry heated air for therapeutic purposes. A special shaped bag is also provided for rectal insertion in the treatment of inflammatory conditions of the prostate, seminal vesicles, urinary bladder, bowel, and the like. With the aid of an additional rubber bulb (fig. 1) a massaging effect can be produced during the treatment by merely pressing and releasing the bulb as often and as forcefully as desired. By means of a simple controlling device air at temperatures as low as 28 F. below zero was circulated through the bag. Thermostatically controlled local refrigeration is being studied experimentally at this time and will be reported in the near future.

Accordingly with this apparatus uniform dry heat together with distention may be safely applied to both male and female pelves over long periods. The maximum temperature and the area of greatest heat concentration is known at all times during the treatment.

Technic

The technic is simple. The deflated bag is lubricated and inserted into the vagina. It is then inflated by means of the pressure bulb, the amount of distention being governed by the comfort of the patient. A pillow placed under the patient's knees also supports the applicator holder so as to eliminate any pull on the pelvic floor. The time clock is set for the length of treatment and the control for the desired temperature, the switch is turned

to "on" and the treatment is started. In contrast to hydrothermic methods no preheating is necessary, as the air in the bag at the beginning of the treatment is never lower than room temperature and will not chill the patient. During the procedure the air is heated rapidly to the desired temperature. As the volume of air increases when it is heated, the bag will expand slightly and thereby produce even better contact with the surrounding tissues, which by this time have become relaxed and more pliable by the heat. If the patient should complain of too much distention, it can be quickly remedied by opening the air valve on the pressure bulb, which permits the escape of air. At the end of the treatment, the switch is turned to "off," the bag is deflated and withdrawn from the vagina. There is nothing to spill that will burn the patient or soil the bed. The applicator together with the bag and specially constructed thermometer (fig. 2) can be sterilized or disinfected as a unit.

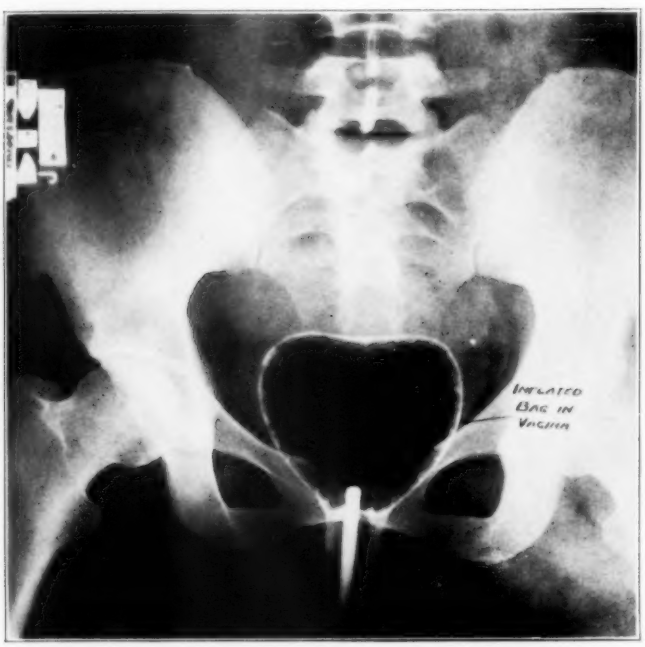

Fig. 3. — Antero-posterior view of pelvis showing inflated bag in the vagina.

Figures 3 and 4 show roentgenologically the position of the inflated bag in the vagina and the marked degree of distention possible without any discomfort to the patient. In order to visualize the bag, a radio-opaque lubricant was applied to its outer surface before insertion into the vagina.

Physiologic Effects of Heat

An increase in the blood supply to any infected area stimulates local response of the tissues. Heat applied to an area produces active hyperemia with leukocytosis and enhances cellular metabolism. Tissue oxygenation is increased and exchange of the metabolites is hastened. The pelvic viscera are endowed with a generous blood supply and the addition of heat to further stimulate the blood flow will markedly aid in accelerating nature's healing processes.

In the treatment of pelvic inflammation by prolonged vaginal heat, the increased circulation favors a marked local phagocytic response, as well as general leukocytosis. This also augments tissue metabolism and rapid absorption of the inflammatory exudate. Clinically this is evidenced by an

increase in mobility of the individual structures, diminution in tenderness and induration, and frequently restoration to a normal cycle in cases of menstrual irregularities. Distinctly palpable inflammatory masses in many instances subside to such an extent that they can no longer be outlined.

In our own series, and one of over 400 cases at the Chicago Lying-In Hospital, blood studies with reference to the leukocytic response taken immediately before and after treatment, revealed a definite increase in most cases up to 20 per cent. This is comparable to the results obtained by Holden and Gurnee[1] who found that 87 per cent of their cases developed an average leukocytic increase of 17 per cent.

There remains a certain small percentage of cases of chronic inflammatory disease of the pelvis in which surgery is indicated. Counseller,[4] who made many observations at the Mayo Clinic, noted that prolonged vaginal heat as a preoperative and postoperative measure, stimulates rapid absorption of exudates, shortens convalescence and diminishes morbidity, hence contributes to a more successful surgical result. In his series, satisfactory results were obtained in 100 per cent.

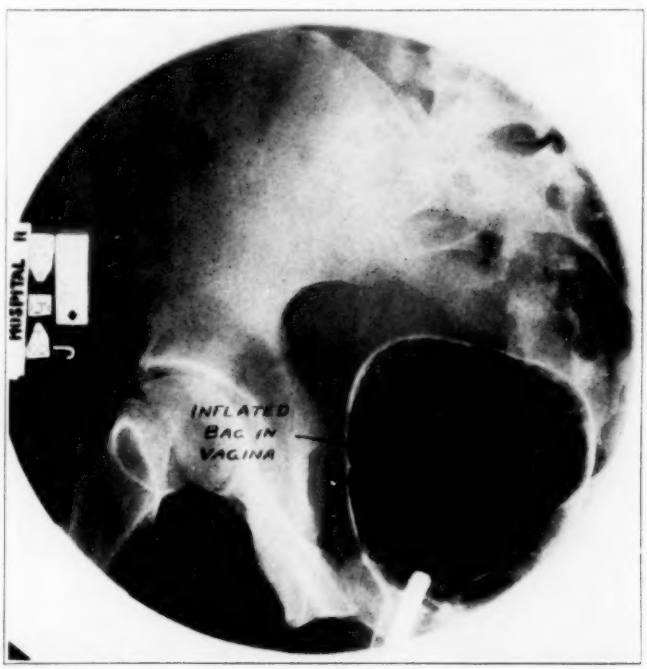

Fig. 4. — Semi-lateral view of pelvis showing inflated bag in the vagina.

Clinical Observations *

Our series consisted of 71 patients with chronic inflammatory disease of the pelvis, which we have divided into the following groups:

1. Chronic bilateral salpingo-oophoritis (39 cases).
2. Chronic bilateral salpingo-oophoritis with unilateral or bilateral tubo-ovarian masses (13 cases).
3. Residual pelvic inflammatory disease following operation (7 cases).
4. Chronic parametritis (7 cases).
5. Chronic pelvic inflammatory disease, spoken of as frozen pelvis (5 cases).

In addition to the above series, 19 patients were treated with marked

* The authors wish to acknowledge their appreciation for the aid evidenced by Dr. Edward C. Bernell in this study.

amelioration of symptoms, but they failed to return to complete their courses or for follow-up observation. While presumably they were improved, we do not include them in this series.

The group with chronic bilateral salpingo-oophoritis consisted of 39 women varying in age from 18 to 52, with an average of 26 years (table 1).

TABLE 1. — *Effect of Treatment on 39 Patients With Chronic Bilateral Salpingo-Oophoritis* *

Age	Duration of Symptoms	Average No. of Treatments	Complete Cure No.	Marked Improvement No.	Moderate Improvement No.	Slight or No Improvement No.
18-52 Years—Av. 26	4 Mo. to 8 Years	14	6	25	5	3

* Three patients in this group became pregnant after treatment was completed.

Thirty-four of these were between the ages of 20 and 30. The preponderance of patients were whites. Twenty-three had symptoms for one to eight years. Six showed complete symptomatic and anatomic cure. Twenty-five showed marked improvement. Most of these patients obtained a complete disappearance of symptoms with definite anatomic improvement. This refers particularly to adnexal masses, increased mobility of the pelvic structures, diminished or absent tenderness and in a few cases restoration of uterine retrodisplacement. Five showed moderate improvement, mostly symptomatic in nature with little anatomic regression. Three showed slight or no improvement either symptomatically or anatomically.

Three of the cases in this group became pregnant some time after treatments were completed, having been sterile from two to four years. Significantly, these patients had spontaneous deliveries of full term normal babies. The course of the puerperium was uneventful in each instance. It is interesting to note that one patient in this group whose primary complaint was severe low backache following a suspension operation four years previously, obtained partial relief by the treatments. Subsequent x-ray examinations of the lumbo-sacral region revealed sacralization of the transverse process of the fifth lumbar vertebrae with superimposed arthritic changes. This emphasizes a fact so frequently stressed by gynecologists and orthopedists alike, that low backache in the female is very commonly due to bony, ligamentous or neuritic changes, unassociated with pelvic disease (fig. 5).

Many of the patients in this series showed a concomitant healing of cervical erosions which were present before treatment was instituted. At this time we are not prepared definitely to state the exact role played by heat in this condition.

Our second group diagnosed as chronic bilateral salpingo-oophoritis with unilateral or bilateral tubo-ovarian masses consisted of 13 women (table 2). These had a moderately advanced type of pelvic gonorrhea with unilateral or bilateral tubo-ovarian abscesses or inflammatory cysts. They varied in age from 22 to 36, with an average of 29 years. The duration of symptoms was from three months to ten years.

TABLE 2. — *Chronic Bilateral Salpingo-Oophoritis With Unilateral or Bilateral Tubo-Ovarian Masses (13 Cases)*

Age	Duration of Symptoms	Average No. of Treatments	Complete Cure No.	Marked Improvement No.	Moderate Improvement No.	Slight or No Improvement No.
22-36 Years—Av. 29	3 Mo. to 10 Years	17	0	10	1	2

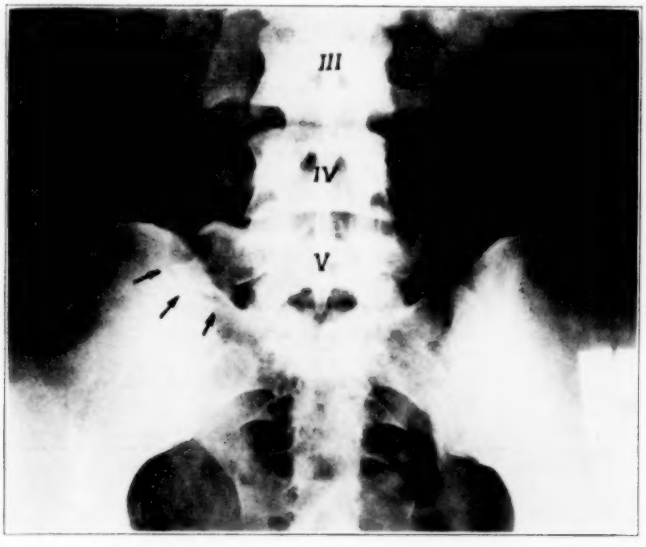

Fig. 5. — Sacralization of the transverse process of the 5th lumbar vertebra with superimposed arthritic changes.

Ten patients showed marked improvement after treatments with pelvic heat. Excellent symptomatic relief was obtained in all. Anatomically, the improvement was based upon lessened tenderness and fixation of the pelvic structures and diminution in the size of the tubo-ovarian masses together with resorption of the products of inflammation. One patient showed moderate improvement with almost complete symptomatic relief. Of two that showed slight or no improvement, one was subsequently referred for surgery, the other did not return for follow-up examination.

The third group with residual pelvic inflammatory postoperative disease consisted of 7 women who had been operated one or more times and had a recurrence of symptoms with residual processes (table 3). The age incidence varied from 24 to 40, an average of 34 years. The duration of symptoms varied from four months to five years. In one patient there was

TABLE 3. — *Postoperative Residual Pelvic Inflammatory Disease (7 Cases)*

Age	Duration of Symptoms	Average No. of Treatments	Complete Cure No.	Marked Improvement No.	Moderate Improvement No.	Slight or No Improvement No.
24-40 Years—Av. 34	4 Mo. to 5 Years	16	1	5	0	1

obtained a complete cure, with subsidence of symptoms and resorption of the inflammatory processes. Five showed marked improvement, evidenced by symptomatic relief and definite anatomic changes. In one instance no improvement occurred after treatments and surgery was advised because of an extensive inflammatory cyst of the ovary.

The fourth group with chronic parametritis consisted of 7 women of which four were postabortive, two postpartum and one postoperative (table 4). The age incidence varied from 21 to 40, the average being 27 years. The duration of symptoms varied from three months to five years. One patient obtained a complete cure. Five cases showed marked improvement and one moderate improvement. On the whole this group responded very satisfactorily to the pelvic heat considering the character of the infections.

TABLE 4. — *Chronic Parametritis (7 Cases)*

Age	Duration of Symptoms	Average No. of Treatments	Complete Cure No.	Marked Improvement No.	Moderate Improvement No.	Slight or No Improvement No.
21-40 Years—Av. 27	3 Mo. to 5 Years	14	1	5	1	0

The fifth group with chronic pelvic inflammatory disease (frozen pelvis) included 5 women (table 5). All had a markedly advanced type of pelvic inflammation in which the organs were diffusely "frozen" and fixed, so that

TABLE 5. — *Chronic Pelvic Inflammatory Disease: Frozen Pelvis (5* Cases)*

Age	Duration of Symptoms	Average No. of Treatments	Complete Cure No.	Marked Improvement No.	Moderate Improvement No.	Slight or No Improvement No.
24-30 Years—Av. 26	3½ Mo. to 5 Years	14	0	4	1	0

* One patient in this group became pregnant after treatment was completed.

the individual structures could not be outlined. The age incidence varied from 24 to 30 years, the average being 26 years. The duration of symptoms ranged from 3½ months to five years.

Four were markedly improved, with complete symptomatic relief. One showed moderate symptomatic improvement. It is interesting to note that one patient in this group who developed a diffuse inflammatory pelvic cellulitis after a septic abortion, became pregnant approximately one year after treatment was completed. The pregnancy was normal and the puperperium uneventful.

Summary

1. We have presented a new device as an improved and effective method for the application of uniform intravaginal heat which is applicable also for prostatic treatment in males.

2. The method utilizes heated air. It is characterized by simplicity, ease of application and freedom from potential burns.

3. Seventy-one patients of chronic inflammatory disease of the pelvis were treated by this method with complete clinical cure or marked improvement in 57 cases (80.3 per cent). Moderate improvement in 8 cases (11.3 per cent) and slight or no improvement in 6 cases (8.4 per cent).

4. The average age incidence for the entire series was 28 years.

5. A large percentage of patients with chronic infection of the pelvis have been benefited by the application of thermostatically controlled heat to the pelvis. Its use is indicated in most cases of pelvic infection as a preliminary therapeutic measure before surgery is contemplated.

6. In the surgical cases the marked local improvement facilitated surgical intervention and shortened postoperative convalescence. In several instances the symptomatic cure was so pronounced that operation was declined, though surgical intervention was advised.

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Discussions

Dr. Disraeli Kobak (Chicago): It is a personal satisfaction to open this discussion for the reason that the study is the conception of a former pupil and more recently a coworker in my department at the Cook County Hospital. It is a source of pleasure to realize that the teaching of undergraduate students often finds fertile soil and stimulates certain of them to further thought and even original efforts in the field of physical therapy. I should like to feel that my most lasting contribution is and will be the inspiration and special interest inculcated into the minds of the students who have come in contact with the didactic and clinical instruction offered at Rush Medical College of the University of Chicago.

So far as the value of this study is concerned it should first be noted that it is not a substitute method nor a mere implication of a therapeutic procedure that is no worse nor better than the original source from which it borrowed its clinical virtues. The fundamental nature of this work which in time aroused the cooperation and support of Dr. Falls and myself, is the original concept of Dr. Newman and represents an advance in the treatment of pelvic inflammations. As explained by the essayist the method has attempted to eliminate some of the hazards and accidents often unavoidable with an agency the clinical applicability of which is as excellent as it is limited in the hands of the careless and non-alert physician. I have reference to the Elliott method of intravaginal treatment by the hot water thermophore and I voice frank praise for its virtues but warn against its careless use. The method used by us in the treatment of the pathologic processes tabulated in the text avoids the accidents reported and those not reported in the literature. The possibility of scalds and burns is limited to practically zero, because the method makes use of superheated air conducted to the tissues by an intravaginal and adaptable thermophore as light as the air it conveys.

So far as concerns the use of conventional and short wave diathermy for similar treatments, my own experience permits me to assert that the Newman approach is simpler, easier and clinically more effective. In the first place the cost of the instrument is within easy reach of the greatest number, the technic is devoid of the difficulties associated with the management of short or long wave diathermy treatments, and finally clinical experience has convinced those who have compared all the present accepted and known methods that the procedure adopted in this report is as simple as it is clinically satisfactory. I fail to have noted that short wave diathermy offers any advantage that is not possessed by the method described by the authors of this paper. I was for a long time loath to accept on theoretical grounds that conductive heating of pelvic inflammations could be as efficient as short wave diathermy, and accordingly voice my confession that only by critical experience have I arrived at the stage where I can assert that the method under discussion is superior to any of the others now employed and certainly by far more effective than short wave or conventional diathermy. Until a time comes when short wave will develop a technic as effective for intravaginal treatment as it has for the surface heating of the body, I feel justified in holding to the opinion that this contribution presents the best that experience and ingenuity can offer for non-operative intervention of pelvic inflammatory processes.

Dr. Madge C. L. McGuinness (New York): Those of us who have been especially interested in the treatment of pelvic inflammatory disease are particularly responsive to the promise of a new method that will help this condition. The many who have been employing diathermy and short wave current realize its value as well as certain of its limitations and are ready to extend an encouraging hand, but with reservations, to new and improved methods for alleviation of this serious gynecologic problem. A number of us have used the Elliott treatment, but did not find it as effective as conventional diathermy and short wave, particularly the former, which in my experience in a great number of cases has proved its great value. Apparently our Western colleagues prefer the Elliott treatment more than we for reasons more satisfactory than that offered by statistical reports. We early found out that there were dangers when a patient was left alone with this treatment. The patient is often excited and somewhat disturbed during a pelvic heat treatment, and by comparison of methods we felt we were getting better results in a shorter time by use of diathermy. The contrasting experiences of East and West by diathermy and the Elliott treatment have awakened interest in the therapeutic possibilities of intravaginal heat. And now with the advent of this more promising method, nothing remains but time and experience to determine its place as the future favorite for use in pelvic pathologic processes. What I am particularly interested to know about this bag and applicator is whether it will deliver an amount of cold or refrigeration for physiologic "cryotherapy" — an old form of treatment recently revived by Fay for cancer. If one could reduce the temperature in pelvic malignancies by this local method it would indeed offer a promising contribution to the control of this serious problem in gynecology. If this will give us the cold that we want and are looking for, so that we will not have to use crude ice treatment and freeze the tissues too much, and if we can keep that cold down to a certain level and maintain it at a constant and controlled temperature for long enough to do some good, I think that this apparatus will be worth its weight in rubies, rather than diamonds of which the Bible speaks.

Dr. George Lyford (Cincinnati): There is little I can contribute to this discussion. The question of the use of heat or the lack of heat — in other words, cold — in treating disease is certainly older than written medical history. It goes back, we know, to some four hundred years B. C. Its use, as far as we know, in pelvic conditions is dated back to about 500 A. D.

We have now a contribution which is a modification of the Elliott procedure in using air, rather than liquid. There are one or two points about which I would like to ask the doctor — beyond that, nothing. I see no reason to believe that from his x-rays he is at all justified in assuming that he eliminates the rugae of the vagina by the pressure and distension of his bag. That has been attempted with all sorts of devices, and no one has yet been able to illustrate that you can distend the vagina to that point. And, further, even if you did, it is questionable whether the increased surface would give a corresponding increase in the heat as it applies to the pelvic organs. Perhaps he has something there that I may have missed in reading over his paper.

On the question of burning, with any form of treatment, I would say you can put molasses through the outfit and it is a very simple mechanical trick to remove the machine quickly if the wall of the bag leaks, whether it is air or anything else, so the question of scalding, if it has occurred, is a matter of pure carelessness on the part of the person handling the treatment. The question raised about pressure necrosis or damage from the weight of the bag is, I think, somewhat academic. I checked the literature and have talked with men giving Elliott treatments, and so far I do not find myself able to discover a single report of that kind. So to me, that is rather an academic question.

The point that particularly interests me is the one Dr. McGuinness mentioned, that those of us from the West are rather prone to the use of Elliott treatments. May be I am the outstanding exception that proves the rule. I think we have found very definitely in our series of cases over the past nine years that the Elliott treatment, although perhaps in the end result as efficacious as the diathermy treatment, is by no means as efficient, and we are very much more prone to use diathermy than we are the Elliott treatment, unless it happens that the doctor using the treatment is out in the country district without facilities, finances or training to use diathermy.

One other thing which I would be interested in knowing from the statistics given, is, what method and checks were used in the diagnosis upon which these groups were made and upon what basis the question of improvement was judged; whether it is a symptomatic thing by pelvic examination, subjectively, and the rest of it. I am not saying by any means that this has been done in this paper. It has been done with all of us. We will classify our patients according to clinical findings to the best of our ability, and perhaps ultimately we may find out that a good many patients really belong to other groups as time segregates them. I think this is a very interesting consideration, but I would like to see some of these perhaps extraneous questions answered.

Dr. Louis B. Newman (closing): With reference to the question by Dr. McGuinness regarding Cryotherapy. With our apparatus, by passing the air through a cooling coil before it enters the bag, we were able to lower the temperature of the air in the bag to sixty degrees below freezing on the Fahrenheit scale. However, this temperature is lower than that required for therapeutic purposes, but it illustrates the possibilities for refrigeration therapy when air is used as the cooling medium.

The shape of the bags are so designed so as to be readily applicable for both internal or external applications of local refrigeration. Further, the air surrounding the patient is also cooled for general refrigeration. At present we are studying the effects of lowered temperatures on cancer as well as other pathologic and physiologic functions.

With reference to the question of Dr. Lyford as to whether the rugae of the vagina are eliminated by the distention of the bag, I point out that when one inserts a vaginal speculum and separates the blades, direct vision will show that the rugae are seen to be flattened. If this can be accomplished by the small amount of distention produced by separating the blades of the speculum, it is evident that when the bag is inflated and the vagina distended to a size several times larger than when a speculum is used, the rugae must surely be flattened. Further, when the finger is placed between the vaginal wall and the bag, the mucosa feels as smooth as the surface of the bag. The x-ray shows the inflated bag in the vagina and the marked distention possible.

We are not familiar with any comparative studies of the Elliott machine and diathermy in the treatment of pelvic inflammations. However, the work of Ivy and his co-workers on dogs showed that with either method it required at least twenty minutes before the maximum blood flow through the tissues was produced; so that diathermy was no more efficient than when using the Elliott machine. The technic of operation is more complicated with the Elliott machine or diathermy than with our apparatus. From a statistical point of view, our method has been virtually studied in a series of over 500 cases, and this is at least as impressive as the personal opinion of one favoring diathermy minus statistical proof.

Dr. Lyford states that the matter of pressure necrosis due to the weight of the water in the bag is academic. We have never used the Elliott machine; however, I can speak of the observations made at the Chicago Lying-In Hospital during the time when they had used the Elliott machine. When burns occurred (I am not speaking of burns that resulted when the bags burst), they were usually on the posterior surface of the vagina where the

greatest pressure is exerted by tension and gravity — a pressure due to the distention plus the downward pressure equal to the weight of the water in the bag.

Isn't it much more sound to treat with an apparatus that will not burn the patient even if the bag bursts, than one using a liquid that will burn the patient if the bag bursts, unless it is immediately removed, which means that the attendant must be at the patient's side at all times?

Regarding our statistics: all of our patients were examined by Dr. Frederick H. Falls, professor and head of the department of Obstetrics and Gynecology of the Medical Division of the University of Illinois, whose experience has extended over thirty years at the Cook County Hospital. The diagnosis and condition of the patient before and after treatment is based on a detailed history and a careful, thorough clinical examination. Patients after discharge were followed up in most cases by an examination every three months. In a few instances the patients did not return for check-up. However, the hospital records were checked to ascertain if any entered at a future time for further attention. In closing may I repeat that in cases of pelvic inflammatory conditions, conservative measures should be instituted first before surgery is contemplated.

A PORTABLE WHIRLPOOL BATH

RALPH S. EMERSON, M.D.

HEMPSTEAD, N. Y.

The value of whirling aërated water in the treatment of certain infections of the extremities has been recognized for many years. The whirlpool bath has already assumed an important place in physical therapy. Often the economic factor limits its application to large institutions and the offices of practitioners who can afford the outlay. The majority of physicians and small institutions would no doubt utilize the whirlpool bath if it did not involve a large investment.

According to Kovács the whirlpool bath acts through sustained local heating, combined with the softening and gentle frictional effect of whirling aërated water. After a treatment of fifteen to forty-five minutes the skin is warm and hyperemic, pain and spasm are relieved, necrotic tissue is removed, and wound healing is stimulated. Lewis believes the hyperemia is produced by the direct action of increased temperature on the capillaries, by reflex dilatation of the large vessels allowing more blood to flow to the skin, and by liberation of an "H" substance which resembles histamine. Grunow attributes the rejuvenating action to increased internal and external respiration of the cutaneous vessels. He believes the hot water tends to activate the connective and mesenchymal tissues through a colloidal increase in surface.

The whirlpool bath here described has been designed particularly for small institutions, physicians' offices, and home use. The apparatus utilizes water power instead of electric power. It is built on the principle of the waterwheel in a manner that the inflowing water will produce suction, and at the same time permits air to be drawn into the circuit.

The unit consists of an aluminum handle, a rotor mounted on a ball bearing, and an air vent incorporated in the distributor portion of the apparatus (figs. 1 and 2). The handle is attached to the plumbing outlet by a rubber hose. The water enters through the hose and handle to the distributor portion. As the water emerges, it strikes the paddles of the rotor which produces the whirling effect. Simultaneously, the water passes over the air vent, sucking in air, and aërates the whirlpool. A piece of rubber tubing is attached to the air vent and leads to the surface of the water. A rubber pad is placed on the rotor to prevent abrasions if the rotor accidentally touches the skin. The outfit is attached to a pail or basin by an adjustable clamp. These are placed in the sink or bathtub

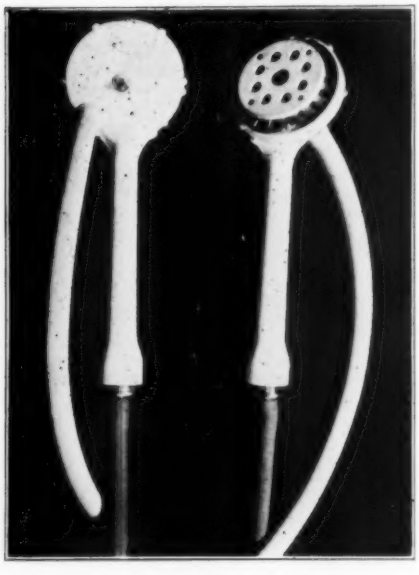

Fig. 1. — The apparatus.

Fig. 2. — The portable whirlpool bath.

which serve as satisfactory overflow receptacles during the constant flow of water. The water pressure should be at least forty pounds for the best results. The temperature is controlled by the hot and cold faucets. The optimum temperature is 110 F A bath thermometer may be easily attached to the pail or receptacle.

This simple instrument offers several features and advantages over the standard whirlpool bath. The outstanding one is economy. The portable whirlpool bath costs but a fraction of the standard equipment and is within the reach of the average practitioner. It is portable and may be attached to most hot and cold plumbing fixtures, either in the office or home. The entire unit is small, light and simple to operate. The apparatus may be readily sterilized by the usual germicides or in the sterilizer. Clean water is always available, and the debris is washed down the drain pipe. Consequently, the infected extremity never soaks in its own dirt, as is often experienced with the older type of whirlpool.

This portable whirlpool bath has been used at the New York Hospital during the past year. It was exhibited at the recent session of the American Congress of Physical Therapy in New York City, and is being submitted to the Council on Physical Therapy of the American Medical Association. A detailed report of its use in physical therapy and peripheral vascular clinics will be presented at a later date.

We have given about two hundred treatments at the Meadowbrook Hospital for infections of the extremities, dog bites, and rectal lesions. Three cases from the Surgical Service are presented. The first two are the usual cases, while the third is an unusual type.

Case 1. — C. T. was a thirty-nine year old female admitted with lacerations of the hands and feet. She was bitten on her hands and left ankle by a dog. Examination revealed numerous puncture wounds on the palmar and extensor surfaces of the right hand. There were five lacerations on the palmar surface varying from one-half to one and one-eighth inches in length, the largest being near the mid palmar crease. There were several less extensive puncture wounds on the left hand and foot.

The wounds were thoroughly cleansed and debrided under general anesthesia and cauterized with fuming nitric acid. Postoperatively, she received whirlpool baths for thirty

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RATIONAL ULTRAVIOLET THERAPY AND SKIN SENSITOMETRY

JEAN SAIDMAN, M.D.

Director of the Institute of Actinology and of the Revolving Sanitarium at Aix-les-Bains

PARIS, FRANCE

Numerous scientific contributions have appeared in Europe devoted to the indications of therapeutic ultraviolet radiation and to such technics which produce the best results in the management of a variety of diseases. Most of these investigations are unknown to America as I had occasion to learn during a visit in the United States. On that occasion I was constrained to point out that actinotherapy and heliotherapy are not sufficiently appreciated by American practitioners. This may be ascribable to a lack of standardized generators without which individual dosages of the ultraviolet rays cannot be properly prescribed, which in turn is probably the main cause for the failure in obtaining the same favorable therapeutic results that have been attained in certain regions of the European continent. Naturally such failures lead to a neglect in the application of light therapy where it should prove highly effective.

Considering that during the past fourteen years I have published three monographs and more than thirty articles on the principles and rational practice of light therapy which have not yet appeared in an English translation, I may be pardoned for presenting a brief review of the results obtained by the methods I have advocated.

Relation of Actinotherapy to Skin Sensitivity

One of the prime basic principles in light therapy is consideration of the thickness and opacity of the epidermis, especially of the superficial dermal layers. It is generally known that penetration and absorption of ultraviolet radiation vary in accordance with the thickness of the stratum corneum. While this represents a purely anatomic problem, it is also to be considered that the skin varies in its sensitivity to ultraviolet radiation (Busck, Finkenrath, Gassul, Keller, Saidman, and others). While such a variation was clearly recognized, clinical deductions were not made until I introduced the term *skin sensitometry,* which subject is a new chapter in physical therapy. The method and technic of the measurement of skin sensitivity are described in my book "La Sensitométrie Cutanée".

The purpose of this method is first of all to determine the selection of ultraviolet generator dosage in accordance with the skin sensitivity of each patient; to establish the prognosis by ultraviolet therapy; to determine the effects of chemical sensitizers upon the skin; and under certain circumstances to clarify certain endocrinologic problems in hyperthyroidism, hypothyroidism, diabetes and arthritis.

The method consists of irradiating a definite part of the skin, generally of the back, with progressive intensities of ultraviolet rays controlled by an automatic device, and determining the dose producing minimum erythema reactions of the first, second, third and fourth degrees.

In clinical practice these degrees of reaction are interpreted as follows. First degree minimum erythema dose (M.E.D. 1) is regarded as the limit of skin tolerance to ultraviolet rays in order to obtain a superficial and ephemeral reaction. Second degree minimum erythema dose (M.E.D. 2) is the limit of skin tolerance to obtain a deeper reaction manifested by pigmentation. Third

degree minimum erythema dose (M.E.D. 3) is the limit required to produce a destructive reaction manifested by subsequent desquamation. Fourth degree minimum erythema dose (M.E.D. 4) represents the limit to produce phlyctena, and is usually 20 to 30 times more intense than M.E.D. 1. With the ordinary sensitometric test it is not observed on normal skin and appears only in certain pathologic conditions, such as diabetes, lupus or psoriasis.

Development of Sensitometric Technic

For the first tests I made use of a plate with 18 holes of various shapes which were closed automatically after 18 minutes by a disc propelled like the movement in a watch. This appliance was first described by me in 1927, and since then has been used by more than 700 European physical therapeutists.

From time to time I modified the small appliance until finally I endeavored to simplify the method of skin sensitometry by the device of a special frame in which the ultraviolet rays are reduced in definite proportions. The numerals for the irradiation intensity are designated as 1 to 9 and terminate with the figure 0, employing a transmission of ultraviolet rays ranging from 10 to 90 per cent of the radiation. The figure 0 is quite transparent, transmitting 96 per cent of the energy of long and middle ultraviolet rays and 80 per cent of short ultraviolet rays.

This new device is the simplest realization for sensitometry of the skin. The frame is fixed upon a metallic plate which is placed on the skin and exposed to the usual source of ultraviolet rays or the sun. The time of exposure must be sufficient to produce an erythema of the second or third degree on a patient with normal sensitiveness.

If the physician has a calibrated actinometer he will expose the subject for the time necessary to give 100 Finsen units* or 600,000 ergs per sq. cm. of the most erythemal radiation (wavelength 2967 Å or its equivalent ultraviolet erythemal radiation with the coefficients of Coblentz).

For the past 15 years I have used a solution of 1 per cent paraphenylenediamine (purified and mixed with sodium sulphite) and exposed for the time necessary to obtain a gray color which is practically equivalent to 100 Finsen units.

The patient is examined the following day and the physician sees on a normal skin, some erythemal red figures, say 4, 5, 6, 7, 8, 9, 0. If the patient is hypersensitive, the figures visible on the skin will be 1, 2, 3, 4, 5, 6, 7, 8, 9, 0; but if the patient is hyposensitive the only reaction detected on the skin consists of a few rose colored marks, such as 8, 9, 0.

The first figure visible on the left side of the test is designated as the minimum erythemal dose (M.E.D. 1). If, for example, it reads 4, 1, or 8, we have the equivalents of 40, 10 or 80 Finsen units, respectively. If, instead of the M.E.D. 1 which appears like rose colored, there is an indistinct figure, it suffices for the actinotherapeutic practice to note the lowest typical red figure (M.E.D. 2) persisting after 3 or 4 days.

Actinotherapy With the Sensitometric Method

As the transmission of ultraviolet rays by the stratum corneum is variable, the doses affecting the living cells of the skin cannot be determined by a simple measure with physical or chemical actinometers. Some patients have a natural "umbrella" for short ultraviolet rays which are absorbed by the superficial epidermis. Such persons cannot be improved by these rays. Other patients have a thin or transparent epidermis and react to small doses. For this reason sensitometric posology does not prescribe absolute doses the same for everybody, but individual doses proportional to M.E.D. 1, M.E.D. 2 or M.E.D. 3.

* The Finsen unit, defined by the French Society of Photobiology (1938), is the energy able to give the same erythemal effect as an irradiation with 6000 ergs per sq. cm. of the wavelength 2967 Å.

Let me give an example of the practical use of sensitometry. Two children, cousins, aged 5 and 7, suffering from cervical adenitis, were treated by ultraviolet rays, but the parents asked to have the treatment stopped because one of the children became too nervous and the other showed no benefit after 24 treatments. I was consulted and gave the advice to make 2 sensitometric tests with the same lamp. One of the children reacted within 2 minutes (M.E.D. 1=2), and the other child only with 12 minutes (M.E.D. 1=12). I advised to start a new treatment after 4 weeks' interruption, but reducing the dose to one-half for the first child and increasing it to three times the exposure for the second child. With this technic the results were excellent and in both children the adenitis disappeared within 4 and 6 weeks. Many other examples show the interdependence of skin sensitivity and the dosage of ultraviolet treatments in order to obtain good effects.

Our technics for actinotherapy are divided into three groups:

1. General treatments which do not require erythema.

   Indications:

   Children with rickets, tetany, debility.

   Adults suffering from anemia, asthenia, diabetes, non-pulmonary tuberculosis and increased metabolism (hyperthyroidism).

   Dosage for the first treatment: between 1/5 and 1/2 of the minimum erythema dose (0.2-0.5 M.E.D. 1).

   Progression for each following treatment: between 1/5 and 1/10 of the minimum erythemal dose.

   Maximum: generally 0.5 to 1 M.E.D. 1.

2. Regional treatments requiring an erythema of the first or second degree.

   Indications:

   Neck. — tuberculous glands, cervical rheumatism, cervico-brachial neuralgia, myxedema.

   Chest. — tracheo-bronchial glands, asthma, pertussis.

   Dorsal thorax. — the same as the chest, and pleuritis, pneumothorax, intercostal neuralgia, juvenile and senile kyphosis, poliomyelitis.

   Lumbar region. — tuberculous peritonitis, nephritis, colitis, nephrectomy wound, Pott's disease, spinal rheumatism, sciatica, enuresis, underdeveloped testis.

   Abdomen. — adhesions, adnexitis, amenorrhea, dysmenorrhea, and the like.

   Arms and legs. — osteoarthritis, neuralgia, circulatory disturbances, Raynaud's disease.

   Dosage for the first treatment: 1 to 2 M.E.D. 1, 1 M.E.D. 2.

   Maximum: desquamative reaction.

3. Local treatments require an erythema of the third or four degree but for cavities the sources, technics and dosages differ.

   Indications:

   Ultraviolet desquamation for skin diseases. — boils, carbuncles, furunculosis, acne, alopecia, areata, psoriasis, ringworm.

   Ultraviolet desquamation as analgesic and anti-congestive (called by Saidman and Nicolle "actinic revulsion" or "actinic cupping" on small surfaces like the window of the Kromayer lamp applied directly on the normal skin). — pneumonia, pleurisy, pleuritis, intercostal neuralgia.

   Blistering destruction by ultraviolet rays. — lupus, warts, keloids, psoriasis.

Posology and Actinotherapy in Children

Sensitometric posology does not solely depend upon the opacity of the epidermis, but also upon the ability of the skin to react with an erythema (by vasodilatation, excitability of the sympathetic nerves, or production of H-bodies shown by Lewis).

The erythemal ability is developed during the first year of life. Infants do not easily react to ultraviolet radiation and require very high doses. Skin sensitivity shows some variations during childhood. I published charts of the minimum erythema dose, depending upon age and sex in my treatise on sensitometry. The average sensitivity of children is only one-half that of adults. Puberty is a period of changes in which the secretion of the sexual and thyroid glands plays a great role. These data are useful for actinotherapy and the enhancement of results by ultraviolet radiation. Special rooms for the treatment of children are advisable in schools and public centers. I described in "Sources de Rayons Ultra-Violets"[1] the "artificial beaches" and I do not agree with the claim that it is possible to obtain solely from the ingestion of vitamin D the same therapeutic results as with direct irradiation of children.

Table 1 summarizes the indications of dosage for some children's diseases in which ultraviolet radiation is indicated. Some cases require only general treatment, others only regional irradiation, but in many instances results are better by a combination of both technics.

We prescribe a coefficient compared to the minimum erythema dose on the back, considered as an individual unit. In fact, the physician who uses a good actinometer at the same time he makes the skin ultraviolet test, is able to express the M.E.D. 1 in Finsen units. Let us suppose that we find the number 4 (or 4 minutes) at 25 inches of a mercury lamp, for an exposure of 10 minutes and that the previous measure showed that at the same distance each minute corresponds to 10 Finsen units. We can write: M.E.D. 1=40 Finsen. If we start the treatment with 0.5 M.E.D. 1, we prescribe 20 Finsen for the first general irradiation. If we have to increase the dose at each treatment by 0.2 M.E.D. 1, the second treatment corresponds to 28 Finsen, the third to 36 Finsen, and so on. If we administer to the same patient a regional treatment with 2 M.E.D. 1 we give 80 Finsen units.

The maximum dose is more variable because it depends upon the epidermic variations during the treatment. The corneal layer becomes thicker, and the irradiated proteins in the skin cells become more opaque, while at the same time the cutaneous nerves are less excited. Only a new sensitometric test shows the new minimum erythema dose M.E.D. 1 which may be 2 to 10 times higher than that at the beginning of the treatment.

Sensitometric Technics for Actinotherapy of Skin Diseases

For the treatment of skin disease search of the minimum dose for the first degree erythema has not the same interest as for general or regional treatments. It is useful only for prurigo or skin diseases associated with diabetes where the doses are less than 1 M.E.D. 1.

For other indications ultraviolet rays are used to obtain a deeper reaction or desquamation of the skin surrounding the lesion. For these it is necessary to know the time or the dose required to obtain erythema of the second and third degrees. Figures appearing after the skin test have the following characteristics: first degree erythema — slight rose marks, disappearing by pressing the skin with glass; second degree — typical red marks, not disappearing by pressure; third degree — livid marks, with enlarged papillae of the skin and a red surrounding outline; fourth degree — blister.

Generally the minimum of the second degree requires a dose twice that of

TABLE 1. — *Indications and Dosage in Children's Disease*

Indications		Initial Dose	Progression	Maximum Dose
Anemia	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
Anorexia				
apathetic child	general	0.7 M.E.D. 1	0.3	2 M.E.D. 1
nervous child	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
Asthma	regional	2 M.E.D. 1	....	.....
Brochopneumonia	general	0.5 M.E.D. 1	0.2	2 M.E.D. 1
	local (revuls)	4 M.E.D. 1	....	.....
Convalescents				
(acute infections)	general	0.4 M.E.D. 1	0.1	1 M.E.D. 1
chronic eczema	local	1 M.E.D. 1	0.3	2 M.E.D. 1
Cranio-Tabes	general	0.4 M.E.D. 1	0.2	1 M.E.D. 1
Entero-Colitis	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
	regional	1 M.E.D. 1	0.5	2 M.E.D. 1
Enuresis	local (lumbar)	4 M.E.D. 1	....	.....
Erysipelas	local	4 M.E.D. 1	1	10 M.E.D. 1
Heredo-Syphilis	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
Hypotrophism (debility)	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
Ichthyosis	regional	2 M.E.D. 1	0.5	4 M.E.D. 1
Infantilism	regional (thyroid)	2 M.E.D. 1	0.5	4 M.E.D. 1
Insomnia Nerv.	general	0.2 M.E.D. 1	0.1	0.5 M.E.D. 1
Otitis media	local	2 M.E.D. 1	....	.....
	general	0.5 M.E.D. 1	0.2	1 M.E.D. 1
Pemphigus	local	2 M.E.D. 1	1	4 M.E.D. 1
Periosteal dysplasia	general	0.3 M.E.D. 1	0.2	2 M.E.D. 1
Pertussis	regional	2 M.E.D. 1	....	.....
Poliomyelitis	regional	2 M.E.D. 1	0.4	4 M.E.D. 1
Pyodermitis	regional	2 M.E.D. 1	0.5	4 M.E.D. 1
Rickets	general	0.3 M.E.D. 1	0.2	1 M.E.D. 1
Scoliosis (early stages)	general	0.5 M.E.D. 1	0.2	2 M.E.D. 1
	regional (back)	2 M.E.D. 1	....	.....
Scrophula	regional	1 M.E.D. 1	0.3	3 M.E.D. 1
Spasmophilia	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
Tetany	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
Tuberculosis	general	0.3 M.E.D. 1	0.1	0.8 M.E.D. 1
Tbc. glands	general	0.5 M.E.D. 1	0.2	2 M.E.D. 1
	regional	2 M.E.D. 1	0.5	4 M.E.D. 1
Tbc. peritonitis	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
	regional	1 M.E.D. 1	0.3	3 M.E.D. 1
Tbc. bone and joints	general	0.5 M.E.D. 1	0.2	2 M.E.D. 1
	regional	4 M.E.D. 1	....	.....
Tbc. adenopathy	general	0.3 M.E.D. 1	0.1	1 M.E.D. 1
Tbc. tracheo-bronchitis	.....	.....	....	.....

M.E.D. 1, and the minimum of the third degree a triple dose, but some variations depend upon the skin and others upon the lamps. Sources of low pressure mercury vapor emitting almost the wavelength 2536 Å give only little progressive reactions and no deep effects. Sources with intensities of 3000-3130 Å give deeper reactions.

Pathologic conditions also change the progression of the erythema. The first degree is insignificant and only the third and fourth degrees are useful for actinotherapy. For illustration the treatment of psoriasis shows how different the results may be, as some authors have no success and others attain the disappearance of the patches (more or less temporarily). In my own practice small doses did not prove favorable. I tried to destroy the patch under a local blister, I observed that when the treatment was started with insufficient doses the lesions look like "vaccinations" even with high doses.

I consider that particularly good results are obtained when psoriatic patches are more sensitive to the blistering dose (M.E.D. 4) than the normal skin. The ideal is to obtain the fourth degree on the patches and only the third degree erythema on the normal skin. Patients who show the same or more sensitiveness on the normal skin and on the patches are not cured. Therefore, it is necessary to make two tests with the same lamp and at the same (short) distance, one on the normal skin and the other on a patch. Actinotherapy will be indicated only if:

M. E. D. 4 psoriasis < M.E.D. 4 normal skin.

Suppose we need 15 minutes at 10 inch distance for the normal skin and only 10 on the psoriatic patch, the best dose will be 10 to 12 minutes regional or local exposure.

The example of psoriasis can also be applied to lupus. Ordinary Finsen-therapy produces a blister on the lesion. Direct actinotherapy must give a deep reaction, able to dissociate the lupus nodules. Sensitometric reactions differ with the type of the lesions. Cases with confluent nodules but without an epidermic ulcer have a good prognosis, and the erythemic reaction shows no transition between the first and the fourth degree. Cases with ulcero-nodular lesions have later actinic reactions. Cicatricial lupus shows typical figures of violet-red color, surrounded by a red line, but progressive of doses gives ulcerations which must be avoided in actinotherapy.

Skin Sensitometry and Choice of Generators

The choice of generators used for ultraviolet treatment depends upon the spectral range of active wavelength in each disease. Only the anti-rachitic spectrum is well determined (2500-3100 Å, with some particular effects of the range 2500-2800 Å). The anti-tuberculous active rays seem to have a longer wavelength with a maximum between 3100 and 3400 Å. Bactericidal ultraviolet is shorter than 3100 Å. Analgesic and anti-inflammatory ultraviolet each had the same spectral range as the erythemal reaction 2400-3150 Å.

But the transparency of the skin is a factor which cannot be neglected. Some types of epidermis absorb nearly all the radiation of a wavelength shorter than 2900 Å, so that the indication of these rays has no applicability. The differences in skin transmission compels the physician who has several generators to select one which corresponds to the sensitivity of each patient.

The differences between individual opacity of the skin can be studied with a spectrograph through freshly desquamated epidermis after an erythema of the third degree. It was admitted after the researches of Hasselbalch that absorption increases with the frequency of the radiation (short ultraviolet having higher coefficients of absorption). The author pointed out that the epidermis is relatively transparent for the range 2800-2480 Å. Later, after my researches, Hausser and Vahle modified the curve of erythemal activity of the ultraviolet rays and introduced a second maximum of 2700-2480 Å. But I consider that their curve is valuable only for some individuals (22 per cent) and not for all. I published several different charts obtained during my researches with a powerful monochromator. Some patients are more sensitive to the wavelengths 2650 and 2536 Å than to 2967-3022 Å; others react very strongly to 2967 and 3022 and not at all to 2536 Å.

It is easier to study these differences by using a double sensitometric test: the one for the usual total radiation, and the other through a filter opaque beyond 2800 Å. Researches were made by Saidman and Nicolle which are summarized in table 2.

TABLE 2. — *Classification of Ultraviolet Sensitivity*

Classification	Number of Patients	Percentage
1st Group. Patients sensitive almost to above 2900 Å (solar ultra-) violet).		
Curve AB activity 3200-3000	13	11
Curve B activity maximum 3200-2900	26	21
2nd Group. Patients sensitive to middle and short ultraviolet curve BC with 2 maxima: 2967 and 2536	42	35
3rd Group. Patients being more sensitive to short ultraviolet: Curve C	39	33

The practical conclusion is that patients from the first group will not benefit when irradiated with sources rich in short wave ultraviolet, such as mercury vapor generators emitting the wavelength 2536 Å under low pressure because the radiation will be absorbed in the superficial corneal layer of the epidermis. However, they will be improved after irradiation with arc generators and artificial sunlight, or with tungsten arc in a bulb-like Mazda Sunlamp. Patients of the second group correspond to the classic curve and can be exposed to any kind of ultraviolet source. Patients of the third group show good results without excessive reactions by exposure to low pressure mercury generators or special poly-metallic electrodes for carbon arc in various conditions, possibly even in skin infections.

Other Applications of Skin Sensitometry

As the efficacy of ultraviolet rays under equal biologic conditions depends upon the opacity of the epidermis, it is possible to utilize skin sensitometry for the prognosis of ultraviolet treatments. Hyposensitive patients who do not react to ordinary doses (more than 50 to 100 Finsen units), will probably not receive much benefit from the treatment. Instead of trying a single ultraviolet treatment I prescribe some such internal sensitizer of the skin as acridine salts, thyroxine, iodine and arsenic.

Hypersensitive patients (M.E.D. 1, below 15 Finsen units) occasionally do not tolerate normal doses and may develop nervousness and insomnia, but they will be improved by reducing the dose (0.3 M.E.D. 1) or diminishing the surface of irradiation.

Patients whose test shows edema or urticaria on the figures of erythema have probably an affection of the liver, which usually contraindicates the use of erythema doses. These patients undergo variations in the sensitivity of the skin, which seems to be a point of emission for toxins.

The ultraviolet skin test may be used for the study of endocrine disturbances. Pronounced differences are observed from one patient to another, and in my own practice I observed extremes as much as 1 and 400 Finsen. For these studies it is necessary to have a generator emitting constant ultraviolet energy. The ordinary mercury type is not very useful for this purpose because its intensity decreases more or less quickly. It is now possible to obtain more constant irradiators with activated electrodes by incorporating very small quantities of mercury. Excellent calibration was made by Coblentz at the Bureau of Standards in Washington. Our own calibration was established in France. We studied especially with Guy Laroche, Serdaris, Hadjipavlos, and Gelband the disturbances of the thyroid gland (Basedow's disease increasing the sensitiveness of the skin; myxedema giving hyposensibility) and of the pancreas (diabetes, hypersensitiveness).

Hypersensitivity and hyposensitivity can be appreciated only by comparison with the normal, and require preliminary investigations in each country. Such studies have been made in Paris with a standard generator with the following results:

Average minimum dose for the first degree erythema (M.E.D.):
25.8 Finsen units or equivalent in 155.000 ergs = 2967 Å on the back;
29.6 Finsen units or equivalent 177.000 ergs on the abdomen.
Average minimum dose for the second degree erythema (M.E.D. 2):
47. Finsen units or 282.000 ergs on the back;
52.6 Finsen units or 315.000 ergs on the abdomen.
Average minimum dose for the third degree (M.E.D. 3):
80 Finsen units or 480.000 ergs on the back;
83.5 Finsen units or 500.000 ergs on the abdomen.

We can summarize these results by considering as normal sensitivity in our country: 25-30 Finsen units for the first degree erythema, 50 Finsen for minimum typical erythema (second degree), and 80 Finsen units for desquamating erythema.

The distribution of skin tolerance (or M.E.D. 1) among different individuals shows the following percentage:

TABLE 3. — *Reaction in Finsen Units*

	Less Than 5 Finsen Units	6-10	11-20	21-30	31-40	41-50	51-100	More Than 100 Finsen Units
Back	1	13	23	33	12	10	5	3
Abdomen	1	4	25	32	16	10	8	4

Sensitometry and Heliotherapy

I consider as hypersensitive patients those whose reaction requires doses lower than 17 Finsen (approximately equivalent to 100,000 ergs of the wavelength 2967 Å) and as hyposensitive those who react only to doses higher than 40 Finsen units (240,000 ergs).

After several years of research in actinology I have attempted to develop a more precise method of scientific heliotherapy (1929). The principles are summarized by Professor Laurens in the introduction of his excellent treatise "The Physiological Effects of Radiant Energy":

> Heliotherapy is coming more and more into vogue. Aside from popular interest and the energy expended in acquiring a coat of tan, perhaps a painful sunburn, many institutes have been created in various parts of the world. One at Aix-les-Bains on the borders of Lac du Bourget in Savoy is worth mentioning. A revolving solarium turns on a pivot and receives the rays of the sun at every hour of the day. It is a gallery 27 meters long, 6 meters wide and 4 meters high. In the center is the physicians' office. The whole structure can be adjusted to the changing position of the sun and can be tipped at the most favorable angle. In each cabin is a concentration apparatus consisting of immense reflectors and lenses by which the intensity of the available energy is increased very considerably. Filters of different physical nature are also used. There are panes covered with a thin, silver film which cuts out infrared and allows ultraviolet rays to pass, and screens that transmit blue, green or red light.
>
> The sensitiveness of each patient is tested by a series of successive irradiations of varying duration, the effect on the skin enabling the operator to choose the best irradiation for the patient in question. A thermopile, applied to the irradiated body surface of each patient, is connected with a registering apparatus located in the control office, so that the size of the dose can be increased or decreased by manipulating the reflectors or the lenses. Similarly the duration of the exposure is varied according to the fluctuations in intensity. If this becomes much diminished, a large number of artificial sources are turned on, thus preventing interruptions in the flow of radiant energy.

Limitation of space prevents description of the improvements and simplifications that have been introduced to my method of concentrating and filtering the sun rays. Small concentrators (60 x 32 inches) are now manufactured in France, and used on the terraces of sanatoriums (Hyères on the French Riviera). Large revolving solariums have been built in France near Cannes and in India (Solarium at Jamnagar belonging to the Nawanagar State). Many scientific works have been published from the Solariums of Aix-les-Bains, Le Cannet and Jamnagar, but little of these researches has reached the profession in the United States.

I shall insist here only on the use of the skin test for ordinary heliotherapy because everybody can apply it. The author's new frame test is applied on the skin of the upper internal part of the thigh just below the inguinal fold. The most suitable position is that allowing the direct sun rays to reach the skin perpendicularly. The time of exposure for patients with-

out control of actinometry is nearly 15 minutes in summer when the sun is high (zenithal distance less than 30 degrees), 20 minutes in the autumn or spring (zenithal distance less than 40 degrees).

Irradiations of normal individuals generally show the figures 7, 8, 9, 0 and indicate that the minimum dose of erythema is 10 or 14 minutes.

For selection of the dose in ordinary heliotherapy the same principles as for artificial ultraviolet radiation can be applied. The most suitable time for the first general treatment with sun rays will be one-half or one-third of the time obtained as M.E.D. 1. For the following treatments the doses will be increased with 0.2 M.E.D. 1, and the maximum that I prescribe is generally not more than 2 M.E.D. 1. For concentrated sunlight the posology is different, for the determination of which the winter's totalizator actinometers are essential.

Summary

The author has devised a method of measuring the sensitivity of the skin exposed to ultraviolet rays.

The latest appliance of the sensitometric test is a special frame which reduces the ultraviolet rays in definite proportions. It is applied on the skin of the back and irradiated under the lamp used by the physician. Next day some figures are visible on the skin as red erythemal marks. They are numerous (all the numbers from 1 or 2 to 10) if the patient is hypersensitive; there are few or no marks if the patient is hyposensitive.

The lowest numeral perceptible on the skin is the minimum erythema dose (M.E.D. 1). If, for example, the patient is exposed 10 minutes and the lowest visible numeral is 4, this signifies that the M.E.D.1 is obtained in 4 minutes.

The minimum erythemal dose being determined, it is easy to select the best technic adaptable to the patient's sensitivity. The result of each actinic treatment depends upon the transparency of the epidermis to the most active rays. Therefore sensitometry of the skin is advised before starting any treatment.

The author gives some examples of the application of this method for general treatments which do not require erythema, regional exposures where erythema of the first or second degree give the best results, and localized irradiations requiring a more intensive reaction (third or fourth degree). It is shown how to select the coefficient of the initial dose and the factors of the progression for some infantile and skin diseases.

Skin sensitometry allows a scientific selection of the generator suitable for each patient, as the erythemal curve varies with individuals.

It is used for some diagnostic purposes in endocrinology (thyroid gland disturbances), and details are given concerning the normal sensitivity determined in Finsen units.

Finally, the author reviews his method of rational heliotherapy by describing the concentration and filtering of the sun rays in special institutions like the revolving solariums, or with smaller apparatus for sanatoriums.

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VASCULAR SPASM IN EXPERIMENTAL GASTRIC ULCER *

A. J. NEDZEL, M.D.

CHICAGO

In one of previous papers (Nedzel[1]) we have pointed out the importance of the blood pressor episodes evoked by the passage of cold air masses (polar infalls); this particular phase so expressed in our latitudes has been ably and fully treated by Petersen.[2] These blood pressor episodes are manifested in our body by exaggerated and diverse vascular spasms in different regions. A constant change in vascular tone is physiologically normal in any living animal and periods of relative spasm are constantly and regularly occurring, but the degree of this change remains within certain limits.

These changes are similar to the "normal fluctuations" in the blood chemical levels as considered by the orthodox biochemist, which have also been found by Petersen[2] to be associated with environmental changes and forming a definite rhythm correlated with the weather. Such a rhythm is also observed in the functioning of the blood vessels, particularly of the capillary bed.

Here there exists a constant and regular swing, diphasic in character, of capillary function which has been designated the ARS phase (anabolism, reduction, spasm) i. e., a sympathicotonia, to be followed by a restorative phase, COD (catabolism, oxidation, dilatation). These physiologic rhythmic periods of constriction and dilatation are usually not manifest clinically in the normal individual.

Our interest lies in the exaggeration of this rhythm with amplification of the phases when we can definitely speak of vascular spasm in certain organs. This means an exaggeration or prolongation of the normally occurring ARS phase to be followed by an increased depression or prolonged corrective COD phase. Such a change in the blood supply if it is associated with a definite focus or extended to certain regions of the body or to whole organs, will naturally lead to nutritive and particularly oxidative dysfunction and insufficiency in parts involved and hence will be associated with the beginning of disease.

Ulcer of the Stomach

Let us consider the pathogenesis of gastric ulcer. The literature of clinical, experimental, and post mortem observations dealing with the pathogenesis of gastroduodenal ulcers presents many conflicting views. Nevertheless, if we exclude direct traumatic agents (chemical, physical, and the like) all the findings point to the same fundamental cause of the ulcer formation; namely, local nutritional inefficiency, transient or prolonged.

Practically all the many ingenious methods of experimentally producing peptic ulcers deal with nutritional changes in the walls of the stomach or duodenum in one way or another, involving the integrity of the local blood supply. Anatomic peculiarities of the lesser curvature of the stomach and the duodenal bulb will under certain conditions lead to nutritional changes in this region that will predispose to ulcer formation, and clinically we know the selected localization of ulcers.

The various intracranial lesions that have been produced experimentally by stimulation of the vagus or paralysis of the sympathetic nerves may also

* From the Department of Pathology and Bacteriology, University of Illinois College of Medicine.
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lead to the formation of peptic ulcers in regions that are more abundantly supplied with nerves, whose action is reflected in vascular dysfunction.

We should also mention that since the time of Virchow pathologic changes in the blood vessels have been observed, leading to vascular obstruction or stasis and ultimately to the formation of ulcer because of impairment of nutrition.

Clinically, it is recognized that persons with peptic ulcers are usually of an asthenic habitus, with vasomotor hyperirritability. The "undoubted influence" (Stewart[3]) of sudden change of temperature in the production of relapses of gastric and especially of duodenal ulcer, and the frequent association of a poor peripheral circulation with gastric and duodenal ulcer have also been noted.

Mechanical trauma from blows on the abdomen with later development of peptic ulcers has been observed, thus involving the reflex action from the surface to the stomach structure. Lately, some authors (Robinson[4]) speak of the role of emotions in gastroduodenal ulcers, pointing to the fact that emotional upset may result in visceral dysfunction, terminating in ulcer formation. Von Bergmann,[5] who believes that a constitutional disharmony in the vegetative nervous system is the essential factor in the development of all ulcers, points to the compression of the blood vessels caused by the associated spasm of the muscularis mucosae and the muscular layers of the stomach.

All this definitely places the emphasis on the behavior and the state of the blood vessels, as the main and intimate cause of the ulcer formations. With normal function and normal nutrition of the gastroduodenal walls, ulcer formation is prevented. Any interference with their function or its disarrangement may lead to pathologic changes in the corresponding regions which ultimately will result in ulcer formation.

Pitressin causes contraction of small arterioles and capillaries. Its action is not uniform in organs or systems of organs in different animals, nor in different seasons. Injection of pitressin actually effects a spasm of the small blood vessels. If we inject pitressin into animals once, or repeatedly, thus causing an anoxemic state in the tissues, objective evidence of alteration of the tissues can be obtained. This has been shown in producing experimental bacterial and bland endocarditis (Nedzel[6]) and in studies of bacterial localization in the central nervous system (Nedzel[7]). It has been previously shown by Dodds, et al.,[8-9] and Nedzel[10] that pathologic lesions in the gastrointestinal tract of animals may be produced by extracts of the posterior pituitary body. These lesions resemble those seen in humans and include multiple hemorrhages, erosions, small and large ulcers of the stomach and duodenum.

Experimental Observations

This paper presents a study of ulcer formation due to pressor episodes evoked by pitressin injection. All the experiments were performed on dogs (usually young) by administering single or repeated injections intravenously. The total number of dogs used was 62, of which 39 animals (63 per cent) gave a negative result and 23 positive (37 per cent), showing different lesions in the stomach and duodenum, ranging from a small erosin to a large ulcer.

After pitressin injections, contraction of the blood vessels occur which may reach such an extent that a vessel filled with blood may actually rupture and cause a hemorrhage directly into the lumen of the stomach. In the wall of the stomach small hemorrhages and also foci of necrosis can be observed in the mucosa. In the submucosa and in the muscular layer dilated blood vessels filled with leukocytes some of which may appear peri-

vascularly can be discerned. On the surface of the mucosa an exudate may form, containing fibrin and formed elements which have passed through the undamaged epithelial layer. Erosion, edema of the stomach wall, necrosis of the mucosa, associated with an increased number of mononuclear cells, healing of the erosions and ultimately typical ulcer formation are found.

It is of interest to note the seasons in which the positive findings were obtained. In September, October, November, fifteen dogs were used and 20 per cent of them gave positive findings; in December, January, February, eighteen dogs gave 50 per cent positive results; in March, April, May, thirteen dogs with 61 per cent positive findings and in June, July and August, out of sixteen dogs 23 per cent gave positive findings.

It would seem that the normal animals which have been fatigued and are relatively more acid reveal greater autonomic difficulty in adjustment to the meteorologic changes, while superimposed pressor effects by pitressin injection apparently lead more readily to prolonged spasm and to prolonged recovery from the effect of spasm.

The experimental ulcers of the stomach formed by pitressin injections heal readily. The so-called chronic ulcers require an additional factor, also of nutritional character, and do not occur so commonly.

The Skin

The skin, as an organ, begins to attract more and more attention in the modern literature. In the first place its participation in many vital metabolic processes has become apparent and the intimate autonomic connection with the body as a whole has become obvious. But there is in our opinion one role which the skin is constantly playing in our life and which I would stress as primary, namely, that of adjusting our organism to the constantly changing environmental conditions. This might seem obvious, but it is constantly ignored by physicians. Actually the skin has properly been termed the "special sense organ" of the autonomic apparatus.

The skin is the most important and vital part in the splanchnoperipheral system. Provoking its activity we stimulate the whole system synchronously. Such stimulation of the skin involves not only initiation of the opposite reaction in the splanchnic area, but also conditions the vessels of the whole peripheral system, involving the brain, muscles, kidney and the like.

Since the skin is the organ which is directly exposed to the meteorologic factors and since these latter are constantly changing, the skin too, is constantly changing its activity, acting on the one hand as a defense for the whole body against deleterious environmental influences, and on the other hand providing substances that are formed as the result of vasoconstriction which definitely stimulate the organism as a whole. In the normal individual we speak of this effect as the invigorating factor in our northern climate. Because of its close autonomic connections the skin reactivity involves changes in a whole group of peripheral and visceral organs. While in the normal these reactions may be salutary, in the deficient individual, or when there is undue stimulation of the skin by heat or cold we may find deleterious effects in the various organs or for the body as a whole.

The physical therapist has and uses agents which are quite potent and active when applied to the skin. It is not my aim to discuss the technic of the various physical measures, but I should like to point out those which are and can be successfully applied in the treatment of patients with gastric ulcers. In the first place, the distress in this disease, due to local symptoms often is so great that we have to employ symptomatic treatment. Hot compresses, sweat bandages, roentgen and ultraviolet irradiations on the abdomen are very helpful. Ultraviolet rays seem to diminish also the secretion

of hydrochloric acid which also gives relief. But the main object from the therapeutic point of view is the stabilization of the entire labile vascular system. At present, it seems, there is only one way to do it and that is with physical measures. By acting upon the skin we may stimulate the splanchmoperipheral system in either direction. Keeping in mind the variety of sensitivity of the autonomic nervous system in different individuals, by careful selection of different hydrotherapeutic procedures accompanied by mechanotherapy, we may re-educate, as it were, the reactivity of the individual, comparable to the widely used "hardening" to render a person less susceptible to colds. The object in both will be the same, namely, change in the vascular responses in the skin as well as elsewhere, for the reaction of the skin is simultaneous with that of the whole body. Galvanization, faradization and the static breeze may be potent adjuvants, as well as autocondensation and high frequency. In other words, for symptomatic treatment we apply measures which help to overcome the spastic conditions and any hyperacidity, while for the correction of the cause of this ulcer symptom complex we use measures which aid in stabilizing the abnormal response of the autonomic nervous system to different agents. These latter usually are of environmental origin and response is manifested by the vascular activity. The skin is the most logical, as well as accessible organ to deal with in these cases. Persons suffering from gastric ulcer are usually anemic, with low blood pressure, so the ultraviolet irradiation, which stimulates the general metabolism, is also of value. It is also worth while to mention that the success of treatment of such subjects in some Spas with alkaline mineral waters should be attributed at least in part, if not mostly, to the general care they receive, and in part to the hydro-, photo-, electro- and mechanotherapy afforded them in such institutions.

Let me repeat that under normal conditions there exists a carefully balanced rhythm in the autonomic, endocrine and chemical control of the body which is in part reflected in the regularly repeated changes in the vascular tone of the blood vessels, particularly the capillaries. This rhythm is largely conditioned by environmental factors, chiefly the weather. It is the function of the autonomic nervous system to correlate and integrate this activity, to balance and co-ordinate periods of increased or of decreased activity on the part of the whole system, as it is related to increased or decreased demand by environmental changes.

In persons who have a normal and well balanced vascular system these readjustments are adequately and promptly met, but where dysfunction exists we may have deleterious effects. In using the term vascular spasm as we here have, we merely understand an accentuation of those normally occurring rhythmic periods of increased tone, which because of functional disturbance in the autonomic nervous system may become exaggerated and involve larger regions and organ areas and may be unduly prolonged.

Individuals with vascular instability have a disturbed splanchnoperipheral balance and poorly adjust themselves to meteorologic changes. Their vascular rhythm is easily influenced and the normal periods of increased tone are readily exaggerated or suppressed in the different body regions and organs. If we keep this in mind in connection with the application of certain of our physical therapeutic procedures, we can readily see that the physiologic status of the patient at the moment when the therapeutic procedure is undertaken must be of considerable significance, for this organic state of the body differs not only with seasonal changes but with the transient meteorologic disturbances which are so common in the northern latitudes of the United States.

(*Concluded on page 708*)

NEW MEANS OF EXPERIMENTAL PHYSICO-DIAGNOSIS *

PAUL LIEBESNY, M.D.

NEW YORK

Modern diagnostics has for some time benefited from physiologic experiments carried out with the aid of a number of physical agents employed in therapy. As an example, both the galvanic and faradic currents have proved extremely valuable in the diagnosis of many lesions of the neuromuscular system. One may include in this field the application of the roentgen rays, photoluminescence of ultraviolet and tests for basal metabolism for a similar purpose. Electrocardiography is another illustration of the importance of the newer methods of diagnosis with the aid of physical agents. These examples could be multiplied to a great extent, but what has been said suffices to point out the facilities offered in the field of diagnostics by physical measures.

In this respect it may not be amiss to point out that provocations are utilized for the purpose of demonstrating how certain organs react. This is best understood by a reference to the examination of the ear through the production of nystagmus by caloric and galvanic stimulation. Other methods attempt temporarily to increase suspected pathologic conditions so that they can be more easily recognized. It is my purpose to report experimental studies made with short wave diathermy with the aim of determining the presence of dental and other foci of infection.

The main seats of foci of infection are, as is well known, the teeth and the tonsils. Foci are to be found also in the sinuses, the middle ear, the appendix, the gall-bladder, the female adnexa, the prostate, the ureters, and the intestine. Inflammation of the veins may sometimes be regarded as focal infections. The most frequent sites, however, are the teeth and the tonsils. It is important to realize that certain diseases may revive old, inactive foci in the teeth or the tonsils by altering the level of immunity or by weakening the power of resistance.

So far as the teeth are concerned not only those with granuloma of the roots but any dead tooth may be the source of infection. Roentgen examination has already proved to be an important means for the recognition of suspected teeth. But this method does not enable the physician to decide whether a granuloma of the roots is to be regarded as an active or an inactive focus. In most of the other possible cases of focal infections x-ray examination is not practicable.

Several years ago a method had been advanced, by which experimental provocation causes local or general reversible alterations in a possible focus of infection. Ernst Mayer[1] employed high frequency uniterminal sparks for provocation of foci and observed a reaction in the affected teeth within 1 to 3 days. He noted local reactions in the affected area of the jaw as well as a slight increase of the body temperature. The method, however, did not prove satisfactory.

In 1932, I[2] made an observation which seemed to indicate that short and ultrashort waves are highly effective for provoking focal infections. It was seen after irradiation of larger abscesses, especially those of the lungs, that the temperature rose by approximately 1 centigrade for one to two days, and that the amount of sputum was temporarily increased. The temperature and the amount of sputum usually decreased not sooner than after the third irradiation. We therefore had to warn the medical and surgical clinics which referred these

* From the Physical Therapy Department of the Bronx Hospital, New York.

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patients that this reaction after the first treatment should not be regarded as a reason for discontinuing the short wave treatment, because usually it has proved very successful in abscesses of the lung.

These observations led to the idea that it might be possible to apply short waves in stimulating doses for the diagnosis of focal infections. The first to perform such a procedure successfully were Gutzeit and Kuechlin,[3] in 1937. These authors observed that the blood sedimentation rate rises considerably for several hours after irradiation of an active granuloma of the teeth. On the other hand the level of the blood sedimentation rate remained unchanged if the irradiated focus was inactive.

Theoretically this method seemed to be promising. The mechanism of blood sedimentation is not yet very clear. However, some causes of the acceleration of the blood sedimentation rate after short wave irradiation can be excluded. There can be no change in the number of the leukocytes or of the erythrocytes. Hydremia and, in general, a gross change in the quality of the blood also may be excluded. We may assume therefore that the increase of the sedimentation rate is due to changes of the albuminous substances of the serum. Provocation with ultrashort waves seems (in cases with positive results) to increase the coarsely dispersed phase (globulin and fibrin). According to Theorell's very important studies the fraction of globulin contains the antibodies and possibly also the toxins. My observations cannot be regarded as a strict proof that short wave irradiation under certain circumstances really might cause a change in the globulin-albumin fraction. It should be noted that the increase of the blood sedimentation rate is more rapid than in other cases of changes in the albuminous substances. Further, the effect can be obtained only if such foci are irradiated that exercise an active influence upon the organism. It is not unlikely that irradiation with short waves of sufficient intensity causes a temporary increase of inflammation and greater permeability for the toxins at the region between the foci and normal tissue. Study of these specific biologic effects of the short waves promises to bring about important biologic and clinical results.

Short Wave Provocation Test

In my department at the Allgemeine Krankenhaus in Vienna which I directed until April 1938, we have examined teeth, tonsils, maxillary sinuses, middle ears, gall-bladders and female adnexa. This work since then has been continued in the Bronx Hospital.*

So far as provocation of dental foci is concerned, we have used the method of irradiation described by Gutzeit and Kuechlin with the only modification that we used a small special transmitter with a wavelength of 15 m. and a maximum output of 10 watts. Experiments revealed that the temperature of 2 cc. normal salt solution rose by 3 C. in 10 minutes. We used for these experiments special dental electrodes whose shape enabled us to irradiate individual teeth. A small transmitter is preferable because a large one often heats the gum too rapidly and to an unbearable degree so that the treatment has to be interrupted for several minutes. Interruptions, however, or any variations in the intensity of the irradiation may considerably alter the results. On the other hand a small transmitter makes possible a steady and uniform dosage. The patients do not feel more than an agreeable warmth in the gum; an interruption of the treatment has never become necessary. Immediately before and two hours after the irradiation we have taken blood samples according to the standard procedure for the determination of the blood sedimentation rate and examined the same by Westergren's method. In the Bronx Hospital we have first used Linzenmay-

* I am embracing the opportunity to express my deep appreciation for the cooperation extended to me by Dr. Alexander Goldmann, President of the Medical Board, and to Dr. David Wurzel, Director of the Dental Clinic of the Bronx Hospital.

er's method, but it is not as exact as Westergren's and therefore unsuitable where the results of different examinations have to be compared. In my opinion Linzenmayer's method should not be used for these examinations. In Vienna, we first treated sound teeth and noticed that such treatment exerted no influence on the blood sedimentation rate. On the other hand patients with an active focus showed a definite increase of the blood sedimentation rate after short wave irradiation.

This is demonstrated by the following case.

Case 1. — A thirty year old patient had suffered from neuritis of the plexus of the right arm for two years. X-ray examination showed a granuloma of the second right upper tooth The blood sedimentation rate before the irradiation was 11 and 33 mm., that is, 11 mm. after one hour and 33 mm. after two hours. The blood sedimentation rate after the irradiation was 19 and 39 mm. — an increase by 72 per cent after one hour.

It must be stressed here that only changes higher than 10 per cent are to be regarded as pathognomonic. Furthermore, it should be mentioned that we could observe the greatest increase of the blood sedimentation rate after provocation in most of the cases in the first hour. Only in a small number of cases was the maximal increase observed in the second hour. After this patient's granuloma had been removed, the neuritis was greatly improved. Three weeks later we made a second examination of the part of the jaw in question. The results were: blood sedimentation rate before the irradiation 6 and 14 mm., and after the radiation 6 and 15 mm., thus showing no increase. I had the opportunity to examine a similar case in the Bronx Hospital.

Case 2. — The patient was sent by Dr. Wurzel for an examination of the second left upper molar. The results of the examination were: blood sedimentation rate before irradiation 9 and 22 irradiation mm., and 13 and 31 mm. after, which means an increase of 44 per cent. The tooth was extracted and parts of the soft and osseus tissues were sent for biopsy to Dr. Felsen who gave the following finding: "Microscopic diagnosis: Section consists of stratified squamous tissue and underlying tissue. The latter is very cellular, the cellular components being of the spindle as well as round cell type. It is my impression that this is some form of granuloma without giant cells." Three weeks after the extraction the results of another examination of the part of the jaw in question were as follows: blood sedimentation rate before irradiation 8 and 19 mm., and 8 and 21 mm. after irradiation, that is practically no increase of the rate. Dr. Wurzel and I soon will report in detail on the importance of this short wave irradiation test in dentistry.

We have also continued to examine tonsils for which we use an apparatus of medium output and air-spaced electrodes of a diameter of 2½ inches. The dosage was such that the skin temperature of the irradiated part rose by 5.4 F. after 10 minutes. Measurements with Mittelmann's[4] dosimeter, which I was able to use for these examinations in Vienna, have shown that the dose used for the provocation of tonsils is approximately 25 watts.

Case Histories

The following three cases have been selected at random out of many to illustrate the importance of this diagnostic procedure.

Case 3. — Nurse, 30 years old, nephritis following a tonsillary abscess. After the acute nephritis had subsided a short wave test of the small and shrunken tonsils was made, showing the sedimentation rate before the irradiation at 15 and 40 mm., and after irradiation at 20 and 48 mm., an increase of 33 per cent in one hour. Ten days after tonsillectomy the sedimentation rate before irradiation was 15 and 38 mm., and after irradiation 15 and 40 mm. — no increase.

Case 4. — Physician, 45 years old, frequent attacks of tonsillitis, plexus neuritis of the left arm for three weeks, sharp pains in the region of the medial and ulnar nerves which prevent the patient from sleeping, paresthesia and weakness in the left arm, acute tonsillitis with fever. Though the acute tonsillitis had not begun earlier than two weeks after the plexus neuritis, one could assume that the chronically infected tonsils were the seat of a focal infection which had caused the plexus neuritis two weeks before the acute condition

in the tonsils had developed. The short wave irradiation test (May 23, 1939) showed the sedimentation rate before irradiation at 11 and 42 mm., and 21 and 43 mm. after the irradiation — an increase of the sedimentation rate by 90 per cent within the first hour. Tonsillectomy was performed by Dr. W. Silberstein on June 3. During the first two days after the operation the pains in the left arm increased, then the condition improved rapidly and soon the pains ceased completely. Slight paresthesia of the fingers in the region of the ulnar nerve and an anesthetic area in the forearm in the same area could still be observed on June 27, that is, 24 days after the tonsillectomy. That day another short wave test was made which showed the sedimentation rate before the irradiation to be 12 and 34 mm., and 17 and 38 mm. after the irradiation. The increase of the sedimentation rate was only 41 per cent as compared with 90 per cent before the tonsillectomy. On July 25, that is, 52 days after the tonsillectomy, a short wave test was made in which the sedimentation rate before irradiation was 10 and 26 mm., and 10 and 25 mm. after the irradiation, that is, no increase.

It has to be mentioned that the sedimentation rate primarily often increases on the third day after tonsillectomy. This increase vanishes, however, regularly after one to three weeks. Sometimes the return to normal cannot be observed earlier than two or three months after operation. Generally there is no primary increase of the sedimentation rate where the tonsils are the focus of infection. Only the examination of the blood after short wave irradiation gives any important results for the differential diagnosis. Even in these cases of tonsillitis where an increase can be observed primarily, the return to normal would follow within the above mentioned period. Otherwise one has to assume according to Kotyzan's[5] recent studies that another focus or another disease e.g. tuberculosis, is responsible for the increased sedimentation rate.

Sometimes the short wave provocation enables us to tell with certainty that the tonsils are the focus of infection where the etiology cannot be proved by any other means. This is demonstrated in the following instance.

CASE 5. — Female patient, 28 years old. Several years ago she had adnexitis, improved soon but always relapsed and had to stay in bed for a long time. Gynecologic examination gave no evidence of a venereal disease. In order to find the focus of infection, the tonsils were examined by short wave provocation which showed the sedimentation rate before the irradiation at 7 and 20 mm., and 11 and 26 mm. after irradiation — an increase by 57 per cent. Tonsillectomy was performed. Another provocation test after 8 days showed the sedimentation rate before irradiation at 8 and 22 mm., and 11 and 25 mm. after irradiation — an increase by 37 per cent. Three weeks later a similar test showed the sedimentation rate before irradiation at 6 and 16 mm. and 6 and 17 mm. after irradiation — no increase. According to information by the attending physician the adnexitis, which had not been treated locally during this time, had much improved (table 1).

TABLE 1. — *Effect of Radiation of Foci Upon Blood Sedimentation Rate*

Case*	Sedimentation		Increase in per cent
	Before	After	
1A Dental Granuloma	11 mm.	19 mm.	72
1B	6 mm.	6 mm.	none
2A Dental Granuloma	9 mm.	13 mm.	44
2B	8 mm.	8 mm.	none
3A Nephritis (Tonsillar abscess)	15 mm.	20 mm.	33
3B	15 mm.	15 mm.	none
4A Plexus neuritis (Tonsillitis)	11 mm.	21 mm.	90
4B	12 mm.	17 mm.	41
4C	10 mm.	10 mm.	none
5A Adnexitis (Tonsillitis)	7 mm.	11 mm.	57
5B	8 mm.	11 mm.	37
5C	6 mm.	6 mm.	none

* A = first test.
B = second test.
C = third test.

Discussion

In the light of our experience we may state that short wave irradiation when applied to normal parts of the body or to inactive foci never cause an increase of the blood sedimentation rate. Only in cases of primarily extremely high sedi-

mentation rate could we observe no increase after the provocation, though the foci were active.

The short wave irradiation test certainly is not 100 per cent reliable, but for that matter no biologic reaction is. We may say, however, from our experience that one may rely upon its results to a very large extent.

We therefore are justified in recommending this method. It may easily be that the application of this test may enrich also the clinical aspects of some pathologic conditions. The number of affections caused by foci is certainly larger than that of possible foci. Without speaking of acute septicemia which cannot be dealt with here, we find first of all chronic septicemia with continued subfebrile temperatures and general symptoms like weakness or headache, apart from neuritis and arthritis. Infectious arthritis often shows characteristic clinical features which cannot be dealt with here in particular, so that it is often easy to distinguish this form from other arthritic diseases. In cases of infectious arthritis the blood sedimentation rate most often shows a primary increase. Infective neuritis is differently located, very persistent and often resists therapy. A focus of infection can also cause allergy e.g. bronchial asthma or urticaria. Nephritis, endocarditis and myocarditis are also well known as diseases which can be caused by a focus of infection.

In fact such infection is not always the only cause of a given disease, but a focus may be active indirectly by weakening the reactive powers of the body or increase the disposition to other diseases. Pathologic conditions in joints or in the lymphatic glands may act as secondary foci of infection so that it is not enough to remove the original focus. This latter fact is the reason for the frequent observation of infectious arthritis not being influenced by the removal of a focus. We had no means up to now of determining in case of several foci which of the suspected ones was the actual cause of the pathologic condition. Therefore sometimes innocent teeth or tonsils may have been removed. That might explain why the theory of focal infection as such was doubted, as for example in a recent publication by Vaizey and Clark-Kennedy[6] of the London Hospital.

In my opinion the short wave irradiation test provides a solid scientific basis for the theory of focal infection. It enables us to state with a large degree of certainty whether and where there is an active focus. We are even able to say which one of several possible foci has primarily to be removed.

This examination also serves to prevent the extraction of teeth which do not cause a focal infection. The same is true with regard to the tonsils. The theory of the focal infection naturally must not lead to unnecessary operations. It is well known that tonsillectomy sometimes causes a considerable loss of weight and this fact has to be regarded especially when the patient is weak. In cases of this kind it is of the greatest importance to answer the question whether or not the tonsils are responsible for a certain pathologic condition. We may say, therefore, that the short wave irradiation test constitutes a valuable method of experimental physical diagnosis.

Summary

1. The term Experimental Physical Diagnosis is discussed.

2. A short wave irradiation test for the determination of foci is described in detail.

3. An underlying theory on which this test is based is elucidated by clinical examples.

4. The test is carried out by irradiating suspected foci and noting the differential effect on the sedimentation rate of the blood.

5. In active infection the sedimentation rate is increased, and unchanged in inactive foci. This gives a reliable basis for the decision whether suspected teeth or tonsils should be removed or not.

6. The short wave irradiation test may furnish a basis for further investigations in the very important field of focal infection.

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Discussions

Dr. Disraeli Kobak (Chicago): I have for long been anxious to hear the latest opinions and results of Dr. Liebesny's studies of certain focal infections by electrophysical methods because of personal information obtained at his clinic in Vienna during the summer of 1937. Knowledge that the problem of dental infection was already engaging the attention of other men to a degree as to imply that important and concrete evidence was at hand which pointed toward a new approach for the diagnosis of focal infections, reawakened my interest in its therapeutic possibilities and in the value of blood sedimentation interpretation. It will be recalled that the latter study was not new to American investigators nor to myself because of the reports already extant on the effect of blood sedimentation by short wave irradiation and of my own studies published in 1936, on the influence of the constituents of the blood on the sedimentation rate by minimal doses of short wave treatments. I confess that I then missed the important implication of any causal relationship to focal infection as shown by Liebesny, and at that time was content with a finding that seemed significant as a chain effect of energy dispersion on the colloid particles of the protein in the blood plasma. I followed the tendency of differentiating an isolated fact and tabulating it into a pigeonhole of experience, rather than attempting to correlate it with other facts into a rational whole.

How reliable the test is of the suspension stability of the red blood corpuscles in relation to short wave provocation, remains a problem for future confirmation. Knowledge of the rate of precipitation of the red blood corpuscles in the plasma has been a matter of record for centuries, but its significance was obscured until Fahraeus in 1921, published his thought-provoking monograph on the subject. This test is today employed on a wide scale as an interpretation of some more or less hidden phenomena orientation in the citrated blood corpuscles in relation to acute infection and chronic intoxication. Certain diseases associated with fever and dissipation of heat and bodily energy appear to influence the reduction time and the suspension stability of the blood corpuscles, and *pari passu* also affect certain portions of the protein molecule, such as the blood sugar, urea and amino-nitrogen, the fixed and free salts, the viscosity and the refractometric index, and the like. The problem becomes involved because while in physical chemistry one may view the part without involving the whole, in clinical practice the part is only a facet or symptom of a vital structure. In acute fevers and infection including the rheumatic and rheumatoid types, the precipitation rate is increased, and broadly speaking the viscosity of the serum is at the same time lowered. In chronic affections including cancer the tendency is toward stability of the sedimentation rate and a rise in the viscosity index. One even notices that cyclic menstruation and pregnancy also are involved in the physiologic behavior of the blood corpuscles by a trend toward increased reduction. Accordingly it is of tremendous importance to us to know that the stability of the blood corpuscles can be influenced and perhaps controlled by a physical agent which provokes certain reactions by localized heat in a given region for diagnostic purposes. The implication though restricted to sedimentation behavior has a far reaching sequela in that it should be possible to show other parallel diagnostic reactions in the line just mentioned. What is of still greater significance is the possible application of the same method as a conservation therapy for gingival, dental and oronasal infections that today are being treated by surgical intervention. By his present work Liebesny has opened up a terrain of diagnostic and therapeutic possibilities which succeeding investigators may develop to control and alleviate gingivitis and pyorrhea, dental extraction to its minimum necessity, and the elimination of tonsillar and other infectious processes to their most conservative indication.

Dr. William Bierman (New York): When I first heard of the technic described by Gutzeit and Kuechlin, I was very much impressed with the idea that here, for the first time, we had available

a definite objective method of determining a possible causal relationship between a focal infection and some evidence of systemic disease. As you all know that many teeth and tonsils have been removed, for example, in cases of arthritis, and this sufferer has not been at all benefited by such removals. On the other hand ever so often an improvement does occur. Thus far we have not had available for our purposes any definite, decisive method of determining in advance which cases might reasonably be expected to be improved by the removal of a so-called focal infection and which might not be improved. Now, I have urged some of my dental friends to check up on this assertion of Gutzeit and his co-workers, and I am therefore impressed to learn of the confirmatory experiences which have been described by Dr. Liebesny.

There are one or two questions I should like to ask the essayist, because the situation is not entirely clear in my mind. He has called attention to the reaction in the sedimentation rate in the treatment of known causes of infection of the tonsils and of the teeth. In other words, determination was made definitely before the use of this test that the tonsil was diseased, that the teeth were abscessed. He has also called attention to the fact that when he has exposed normal teeth and normal tonsils to the short-wave current, there was no change in the sedimentation rate. He has not, as far as I can see, cited any instances, although he has referred to the idea of known dental or tonsillar infection which, after treatment by means of the short-wave current did not show any changes in sedimentation rate. In other words, if he can show that it is only those cases of focal infection which are responsible for a systemic disease which give an increase in sedimentation rate, then we will have something of very definite value.

As it is today, Gutzeit and Dr. Liebesny have merely shown a facet which is of enormous interest in that there is an increase in sedimentation rate after applying the short wave current to known local infections, but this presentation has not clearly indicated that there are cases of definitely infected teeth and tonsils which do not show a sedimentation rate. I appreciate the fact that Dr. Liebesny is aware of the point, but he has not clearly demonstrated, by citing any specific instances, as he has cited specific instances to show that it is possible to get a change in the sedimentation rate. In other words, to prove his case he has to call attention to cases of non-local infection with no known sedimentation rate.

Unquestionably, this method, if it proves to be as correct as it appears to be, will be of inestimable value to the profession in that it furnishes us for the first time with the possibility of differentiation between those cases of focal infection which can be responsible for systemic disease, and possibly those cases which have no relation to systemic disease, such as we appreciate from the lack of therapeutic results today. I have felt that with political events as they are abroad, we in America as American scientists are going to be enriched by the work of men who have demonstrated their capacity for original thinking and for work which would redound to our benefit, and I am glad to see the first demonstration of that belief. We in America are fortunate in that men of science who can contribute to medicine are with us now. It is Europe's loss, and our gain.

Dr. Karl Harpuder (New York): Dr. Liebesny's method of investigating the activity of foci will certainly be of very valuable aid in the diagnosis and the proper treatment of certain infectious and allergic diseases, and I feel that Dr. Liebesny should be congratulated on this work. As Dr. Liebesny also has emphasized, it is necessary to accumulate extensive material before evaluating the reliability of the simple test. It would be interesting to know how foci in otherwise apparently healthy persons react. Such foci are known to exist very frequently. I would like to ask whether an eventual positive reaction indicates imminent disease or not.

In Dr. Liebesny's cases, at least in the ones he quoted more extensively here, removal of the focus was followed by cure or improvement of the secondary disease. Frequently, we are not so lucky, as Dr. Bierman has pointed out. A thorough purge of clinically active foci may not meet with any success. Will the reaction tell us not only of the pathogenic significance of the foci but also whether the removal of the focus will be successful or not? An active focus may be removed and the secondary disease may go on, and in my experience at least, more rarely, an active focus may be removed and the secondary disease may be improved. Now will this reaction tell us about the prognosis and about the pathogenic significance of the foci? The speed with which these alterations of the sedimentation rate develop and the minuteness of the lesions which caused them are remarkable indeed. They suggest in my opinion the release of some active metabolite by means of short wave heat which influences the balance and the regulation of the plasma proteins. Is it known when the sedimentation rate returns in positive tests to its previous level, and how it returns?

Dr. Richard Kovács (New York): I want to join in the general conviction that the time has come to call a halt to indiscriminate slaughter of tonsils and the extraction of teeth. Evidence in the international literature is accumulating that results after this focal elimination, so-called, are generally rather disappointing. Spectacular results, at any rate, are the exception. Now, whether this method as so ably presented here will solve our problem, is something that needs further investigation and clarification.

There is at least one paper in the recent literature which definitely states that controlled investigation of the sedimentation rate has proved disappointing. Controls

have shown that it was indifferent. One could not tell by the sedimentation rate in a set of active cases as Dr. Bierman pointed out, that the results were definite. Therefore, we greatly appreciate this presentation because it calls for definite control on an extended scale.

Dr. Nathan H. Polmer (New Orleans): Certain questions have arisen in the minds of all of us. This apparently is a simple procedure. It has the advantage that, first of all, it does no harm to the patient, and secondly, it seems to be a procedure that each of us can carry out in our clinics and offices. But the use of this procedure seems to depend on two things: First, on special technic, and second, on electrodes. Personally, I intend to remain after the close of the convention to visit Dr. Liebesny and see his technic and electrodes, and I feel that I express the hope of many of us that we would appreciate if sometime during this meeting he would demonstrate his electrodes and technic. The next question is: Does conventional diathermy produce the same reaction? Another question we would like to have answered is: Is this a specific effect of the 15 meter wave, or do other short waves produce the same effect?

Dr. Paul Liebesny (closing): I want first to repeat what I said, that only an active focus shows a reaction like this, especially if the focus of infection arises with general disease in the human body. If we have, for instance, an abscess of a tooth, and this abscess is not accompanied by systemic reactions associated with arthritis or neuritis, we see no change in the sedimentation rate by the radiation of the teeth. The same is true of the tonsils, for not every case of tonsillitis shows this reaction, and we find that in the blood sedimentation rate primarily does not increase. But after tonsillectomy, we find in most cases that we increase the blood sedimentation rate.

In answer to Dr. Harpuder's question, if we remove a focus of infection in most cases there is general disease, I will say that in many cases the general diseases retrogress.

The fourth case I mentioned is a very interesting one, that of the physician with tonsillitis and acute neuritis. After removal of the tonsils, and after a period of twenty-four days, we see the decrease of the blood sedimentation rate from 90 to 41 per cent, and not until after a period of fifty-two days do we see the normal sedimentation rate returned after irradiation. I think we have in the short wave radiation test a rational answer to the question whether a focus of infection is active or inactive. And we find that after removal of the active focus of infection, the sedimentation rate after the irradiation is not increased. In reply to Dr. Polmer, I should be glad to show the technic which is used in this measure. I did not go into details because of the limit of time.

A Portable Whirlpool Bath — Emerson

(Continued from page 672)

minutes twice a day until discharged on the fourteenth hospital day. The patient asserted that the whirlpool baths were very soothing and relieved the stiffness and aching pains in her hands and feet. A check-up at the end of eight months shows she has perfect function and very little scar formation.

CASE 2. — F. S. was a twenty year old male admitted with a four day history of pain and swelling of his left big toe. Wet magnesium sulfate dressings had been used at home without effect. General supportive measures and whirlpool baths produced early localization of the infection. The fluctuant area was incised and drained, and the patient was discharged as recovered on the seventh hospital day. The portable whirlpool treatment definitely alleviated the pain.

CASE 3. — R. G. was a forty-two year old male admitted for a plastic repair of the perineum and anus. Due to the notoriously poor results in this type of surgery, a preliminary Devine operation was done to divert the fecal stream. In spite of this precaution the perineal wound would not heal under routine care. We devised a rectal whirlpool bath by placing the portable whirlpool apparatus in the bottom of a pail, which was in turn set in a bathtub. A rubber ring was then placed on the top of the pail. The patient sat on the rubber ring and received whirlpool baths for thirty minutes twice a day for three months. He said the baths relieved the soreness and made him feel good. The whirling water was much more effective than the ordinary Sitz baths. There was a slow but definite improvement in the rectal wound. It is difficult to evaluate a case such as this. However, I believe it is presumptive evidence of value for an apparatus when a patient will spontaneously and consistently utilize it over a period of three months.

CARCINOMA OF THE CERVIX: EARLY DIAGNOSIS AND TREATMENT *

WILLIAM HOFMANN, M.D.

INDIANAPOLIS

The insidious onset of carcinoma is the greatest obstacle to early diagnosis and to proper early treatment. This holds particularly true for all internal cancers. In cancer of the cervix the subjective symptoms are not evident until the condition is too advanced to be promising of reasonable therapeutic results. The "gangster cells" [1] through their lawlessness have gained a serious headway under cover before the pathologic condition is recognized either by the patient or the physician. The patient as a rule has no definite signs or real prodromata as in most acute or chronic diseases. About the first and earliest symptom described by the vast majority is lassitude, but the symptoms are so trivial that no advice is sought except by the more alert and nervous type of women.

According to statistics for the past decade, carcinoma has ranged second as a cause of death in the United States, being surpassed only by cardiac diseases. In the past year alone about 150,000 have died of cancer, and this in spite of the valuable advances made in recent years in checking the progress of the disease. It has been reliably estimated that there are approximately 400,000 patients receiving treatment at the present time in this country. Between 15 and 30 per cent of all cancer deaths in women are caused by uterine involvement, and of these cases 90 per cent are diagnosed as cancer of the cervix. Stearns[2] examined some 2,300 women during a period of five years in his clinic and found that 70 per cent had some form of diseased cervix, and of these fifteen women, or .016 per cent, were definitely cancerous. Incidentally a large percentage of the women examined were young and not elective or selective cases, but represented the general run one is apt to see in a clinic.

Diagnosis

There are various methods for early diagnosis, of which the simplest is inspection of the cervix with adequate exposure of the field and ample light. Such examination should expose any pathologic differences in the surface epithelium. One can magnify the field by Hinselmann's colposcope, or a similar instrument, thereby enlarging the details from ten to forty times, depending upon the instrument used. Unfortunately, the colposcope has had limited use because of its original costliness and lack of appreciation of its diagnostic value. With a satisfactory light and magnification the most minute lesions become visible. Hinselmann[3] examines all his patients routinely with the colposcope, as a result of which he discovered leukoplakia on the cervix in one out of every 114 women. This clearly shows the great need of colposcopy, if not as a routine measure at least in all cases manifesting some pathologic lesion of the vagina or cervix.

Another method of early diagnosis is the Schiller[4] iodine test. Both methods are only relative in value as compared with biopsy, which allows accurate histologic study.

The normal epithelium of the vaginal portion of the cervix and of the

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vagina contain a large quantity of glycogen. This disappears quite rapidly when the epithelium becomes carcinomatous. This change can be readily detected by the iodine stain, which produces contrasting reactions of the glycogenic and non-glycogenic epithelium. With an aqueous solution of iodine, the glycogen in the superficial layers quickly takes on a dark brown color, usually in about thirty to sixty seconds. When glycogen is absent, the epithelium remains grayish-white and unstained. Gram's[5] solution should be used and not the alcoholic tincture of iodine, since the latter coagulates the tissue and penetrates the coagulated tissue without any variation in color irrespective whether glycogen is present or not. Schiller believes that Gram's solution consisting of one part iodine, two parts potassium iodide and three hundred parts of water, gives sharper differentiation than the more rapidly acting but much more diffusely staining Lugol's solution of higher concentration. There are various methods for staining, but it has been found that the most convenient has been by spraying the iodine on the surface of the epithelium with an ordinary non-metal atomizer. Before applying the stain it is useful to wipe the surface gently with a dry cotton pledget, avoiding undue force. This is done to insure against any mucus or other foreign material which might interfere with the direct action of the chemical. Any area that remains white or unstained should be considered suspicious of carcinoma. These areas should be selected for biopsy, and a thorough microscopic examination of these specimens is imperative. The histologic diagnosis is based on the irregularity in the arrangement and distribution of the nuclei and the atpyical character and polymorphism of the epithelium and the tendency of invasion. The method of obtaining a biopsy specimen is an office procedure and may be carried out with or without a local anesthetic, the latter being preferred by me. One may use a scalpel, a spoon curette or a rongeur biting forceps. Naturally the aim is to avoid all possible trauma, but it has been my experience over a period of twenty years that any extension of the disease as a result of biopsy is very rare, in fact, I have never seen it. It has been my custom when the first biopsy has proved either negative or doubtful on histologic examination, to repeat this procedure by a "follow-up" biopsy when the clinical picture was suggestive of malignancy. There is always a possibility of missing the involved area when taking a specimen. I feel that biopsy should be taken in all cases whether moderately or far advanced, as well as those examined only as suspects, in order to determine not only the presence of malignancy, but its histologic classification.

Early carcinoma consists of a superficial layer with a smooth surface and shows very little variation from the normal structure. There are no distinct papillary recesses or ulcerations. Later this surface epithelium becomes dull and eventually wrinkled, less transparent and lighter in color, presenting the clinical characteristics of leukoplakia. Hinselmann believes that leukoplakia in general must be considered a precursor of cancer. It has been considered for many years that cancer would follow leukoplakia of the tongue or of the vulva, but this does not hold true for the milder cases of leukoplakia of the cervix, in which the microscopic picture reveals no resemblance to cancer.

Another interesting histologic observation is intraepithelial cancer in which a disposition to invasion cannot be demonstrated. This condition is called Bowen's disease of the cervix by Novak,[6] due to its similarity to so-called Bowen's disease of the skin. Many pathologists still do not concede the actual malignancy in the pre-invasive phase.

With many years of study, pathologists have learned that certain his-

tologic variations are associated with clinical malignancy.[7] These variations, such as those that are concerned with cell changes, hyperchromatosis, mitotic activity and polymorphism, are some of the criteria for tentative or definite diagnosis of carcinoma in the pre-invasive stage. The diagnosis is much simpler with the above described picture and the addition of invasion. In some instances where some of these conditions exist in a mild form, the transition from the normal to the abnormal is so slight that one may easily be misled into an erroneous diagnosis. Again, the opposite may be true, resulting in unnecessary delay in diagnosis and treatment.

At the point of transition of the cervical canal from the normal stratified epithelium to the columnar type, one sees variations to which the erroneous name of erosion has been given. On microscopic study in many instances the appearance of these areas reveal no evidence of loss of tissue. As pointed out by Ries,[8] Ruge, Veit and later Myers studied the microscopic appearance of these areas and called them "pseudo-erosions," it being evident to them that there was no loss of tissue, nevertheless many clinicians still persist in the use of this erroneous term. The columnar cells are stimulated by the estrogenic hormone causing this overgrowth miscalled "erosions." This cellular overgrowth of the cervix may, on inspection, arouse a suspicion of carcinoma. Biopsy will definitely reveal the true nature of the tissue and decide the question of malignancy.

While true erosions are visible to the naked eye, colposcopy affords opportunity for better study, revealing true loss of surface epithelium, the actual punched-out ulcer appearance, and in the more chronic type an undermined edge. The general color contrasting with the lighter pink surrounding tissue may suggest a possible malignancy. The microscopic picture will show the ulcerated surface area with round cell infiltration and irregular proliferation, indicating inflammation. Down-growth of the squamous epithelium frequently follows a glandular lumen and the extension continues beneath the columnar epithelium of the gland. When one observes this down-growth the condition is suggestive of adenocarcinoma. It is either a case of squamous metaplasia of the cells lining the gland, or the squamous cells may be seen beneath surface columnar epithelium by extension. A careful microscopic examination of the cells fails to reveal hyperchromatosis, mitotic figures or irregularity in the nuclei. Retention of the normal size, shape and staining quality of the cells speaks against malignancy. Mitotic figures in the cervical epithelium and hyperchromatic nuclei[9] are suggestive of malignancy and the presence of both practically establishes a diagnosis of either the squamous cell or glandular type of carcinoma of the cervix.

In the more infrequent form of adenocarcinoma the possibility of an early diagnosis is more difficult than in the more common squamous cell type. In its early phase it is usually concealed within the cervix which externally may appear normal. In rarer instances it develops lower down in the cervix thus being slightly visible or more readily palpable. When it appears along the cervical canal it cannot be readily differentiated from adenocarcinoma of the uterus except by pathologic examination, and even then may at times be difficult. This difficulty may be overcome by operative procedures determining the site of the growth together with the morphologic nature of the cells.

In the squamous cell type of cancer the differentiation can always be accomplished by simple inspection and palpation of the cervix, as it commonly develops on the vaginal portion of the cervix. In the earliest cases or in occasional instances in which this type develops in the cervical canal, the condition is often unsuspected, until the tissue is excised and subjected

to microscopic examination. This latter procedure will enable us to differentiate between the squamous cell and the glandular type. The glandular type occurs rather rarely, probably not more than in two or three per cent of all cervical carcinomas. In the past year or two the incidence of adenocarcinoma has been only about 1.2 per cent of the total number of carcinomas of the cervix examined under my personal supervision.

Therapeutic Problems

Discussions of the past ten years relating to the treatment of carcinoma of the cervix have simmered down to the rationale and technic of radium and high voltage therapy. Surgery for the most part has been relegated to a minor position, as an adjunct to radium and x-ray. For years the controversy had been raging between the advocates of surgical removal, preferably by the Wertheim method, and those of radiation. In more recent years some authors are again defending surgical methods, preferring the vaginal to the abdominal, or Wertheim method, on the ground that adequate removal has a reduced mortality and morbidity. None of the statistics of the followers of this method have compared favorably to a similar series of cases treated by radium and x-ray. According to a recent report on early carcinoma of the cervix by Ward, Sacket and Nelson[10] they were able to salvage 56.2 per cent over a five-year period, as compared to 28.8 per cent of all patients treated in various stages, showing the importance of early diagnosis and treatment of the disease with radium and x-rays. In another report by Bowing and Fricke[11] it is noted that 69.2 per cent of patients with lesions in stage 1, and 60.2 per cent of those with borderline lesions were in good health after five years, both types having been treated with radium and deep x-rays.

Surgical statistics were not as comprehensive as the aforementioned results of the above mentioned reports. Therefore, one could not gain definite impressions from the reported results. They did, however, lead to the conclusion that the immediate mortality and morbidity was definitely and decidedly higher. These surgical statistics vary in claiming from 22 to 52 per cent cures after a five-year period, the higher figure being accounted for by early diagnosis and operation of patients who were mostly of grade 1 type with a few grade 2 types of carcinoma of the cervix.

In spite of these data surgery must not be underrated as a valuable procedure in eliminating the entire malignant growth, as is often possible in early carcinoma. Simple amputation either by the knife or electrocautery or both combined can and will in many cases be completely satisfactory, but one must be wary of the possible omission of unseen areas of extension, and a follow-up treatment of radium or x-ray has been found to be highly advisable. Furthermore, where a pyosalpinx, tube-ovarian abscess or pyometra exists in association with cancer of the cervix, the surgical removal of these processes is essential before proceeding with irradiation. But surgical intervention must be strictly limited to the diseased adnexa and three to four weeks later radium or x-ray may be used.

From the many and varied methods and technic used in the treatment of cervical cancer, it must be apparent that there is no perfect method as yet. Just as the surgeon has his personal limitation in his technic, so also has the roentgenologist and radiologist.[12] It is absolutely essential for the best interest of the patient and the proper treatment of the malignancy that there be thorough cooperation between clinicians in their respective fields.

The Curie Foundation and many other large centers the world over use a combination of radium and external roentgen therapy as the method of

choice. These two phases should be considered as part of one and the same treatment. It is essential to give a preliminary series of deep x-ray applications. This causes some regression in size of the local growth and reduces or eliminates infection within the cancer and the adnexa. The presence of virulent germs may cause a local or general reaction to the external radiation, which forbids continuance of the treatment at least for the time being, or may suggest surgical intervention[13] at some time. Primary intra-uterine radiation in cases of this type would frequently cause fatal accidents unless one uses small and fractional doses over a protracted period. It is necessary to individualize with radium and x-ray in the treatment of cancer of the cervix to derive the greatest benefits. Since the therapeutic influence of the radium rays does not extend beyond two or three centimeters and does not reach the disease in the parametria, external radiation is essential to cover these areas. Subsequent to preliminary external radiation, intra-vaginal and cervico-uterine treatment is given with radium, generally after an interval of two to four weeks, depending upon the reaction to the external radiation. Cervico-uterine[14] treatment with radium is given in platinum capsules in a tandem arrangement. Each capsule is 1½ mm. in thickness and contains about 30 mgm. of radium. As a rule two capsules are placed within the uterus. A similar dose of radium is given and similar platinum capsules are used intra-vaginally against the under surface of the cervix and the adjacent parametria. The latter are covered with an additional rubber tubing about 2 to 3 mm. in thickness. The uterine epithelium is much less sensitive to radium and therefore requires a lesser degree of filter than the vaginal epithelium. The vagina is lightly packed with gauze to reduce the influence of radiation on the bladder and rectum. In addition an indwelling or retention catheter is placed within the bladder during the administration of the radium. Prior to its implantation the patient is prepared as for any major surgical procedure by a thorough cleansing of the bowels, emptying of the bladder, and the like. A general anaesthetic is rarely necessary except possibly in highly emotional or nervous patients, and frequently even these can be successfully managed with a small dose of morphine or one of the barbiturates. It has been our practice to give the treatment in one single seance of approximately 3,000 to 3,500 milligram hours, intra-cervico-uterine and the same amount intra-vaginally, the dosage depending upon the size of the growth and thickness and density of the cervix. Implantation of radium needless or seeds has been used in a comparatively few instances, but has met with favor only in the fungoid form with an impervious cervical canal. The use of needles or seeds through the vagina has been condemned by many as dangerous. They are likely to produce radio-necrosis and fistulas due to insufficient filtration and lack of precision in placing them. They also involve considerable risk of infection.

The second half of the external radiation is given about two weeks after the implantation or intra-uterine radiation. This whole procedure takes about five to eight weeks and necessitates actual confinement or stay in the hospital of approximately three to five days, causing little morbidity with the mortality being virtually nil.

Having stressed the extreme importance of early diagnosis, followed by thorough and careful treatment, a further duty falls upon the clinician, namely, to follow-up[15] the progress of his case for at least three to five years. The patient must be impressed with the importance of keeping in frequent touch with the physician during this essential period of observation and progress.

Conclusion

1. Early diagnosis and treatment is essential to reduce the morbidity and mortality of cervical carcinoma.

2. Women should be educated of the importance of periodic examinations.

3. Examinations should be all-inclusive and thorough, including colposcopy and Schiller's diagnostic stain.

4. Biopsy is essential in every suspected case.

5. Adequate treatment must be carried out promptly by either operation, irradiation, or both.

6. All treated patients should be repeatedly examined for possible recurrence for at least five years.

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ARCHIVES of PHYSICAL THERAPY
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.·. EDITORIALS .·.

THANKSGIVING

As the month of November begins to approach the close of the year, American custom and tradition has set aside a day for thanksgiving which today is poignant by comparison more than ever in the history of mankind. Originated by the Pilgrim fathers as a harvest festival, it was our great martyred President, Abraham Lincoln, who made it a national holiday by proclamation. It is indeed meet that this year our nation and our profession should pause in their labors to reflect upon our extraordinary fortune of being part and parcel of a people who can still enjoy the dignity of humans and the rights of free men. This thought alone arouses a grateful surge of emotion which unfortunately has become impossible in many of the benighted countries abroad on what should have been a continent devoted to culture and humanitarian endeavor. When one recalls that for years European universities, higher schools of learning and institutions for research were animated by the highest ideals and that their representatives manifested in their lives an exemplary spirit devoted to the betterment and ennoblement of mankind, it is indeed tragic that these torch bearers of spiritual liberty and freedom in science and the philosophies have been degraded to the level of regimented soldiers, gagged in the freedom of expression and compelled at great risks to shout for a perversive ideology. What a contrast between our beloved country and the old respected homelands of those who immigrated to aid in the establishment of our great nation. While we in America can pursue careers dear to our hearts, untrammeled by dictates and dicta, in this moment of thanksgiving our heartfelt sympathy goes out to our colleagues in distant countries who are at this moment deprived of their immunities and prerogatives.

The moment is opportune seriously to study our national history through which runs like a red thread efforts of peace rather than victories by force. This will lead to a realization that as a people we have become one united country through the application of reason and good will in both our intimate and interstate relationship. It was only for these reasons that many different creeds and nationalities reflected by such contrasting sects and peoples as the Puritans and Quakers, the Hugenots and the Dutch, and others, escaping from the tyranny of absolutism and bigotry were able to fuse their concepts and ideals into a homogeneous commonwealth, the full realization of which was the impetus to express themselves in a sentiment of thanksgiving. Though many years have elapsed, it is due to the fundamental code of national ethics that the United States is not only a powerful and humane nation, but one in which every human being is protected in his legitimate pursuits. For this and all that it implies our people today as of yore give thanks from a full heart.

We of the medical profession, too, have come to take a full share in this spirit of thanksgiving. Our institutions of learning, our hospitals and laboratories devoted to research have been able under the aegis of peace and freedom to progress to a degree which has been accorded universal appreciation and respect. American science, and this includes medicine, has been enabled to present new and far reaching discoveries because the seeds of research have been planted in a fertile soil and democratic environment. Private endowments and the bounties of our States have been placed at the disposal of many of our

qualified educators and institutions for the purpose of raising standards and advancing the sciences and cultural pursuits. Nor can one fail to appreciate that precisely such efforts tended to increase the well-being and the cultural development of our whole body politic.

So far as concerns physical therapy, we too have special cause for thanksgiving because of the great facilities that have become available in a number of richly endowed and state universities and associated institutions in which our science is furthered by this benevolence and interest in the service of humanity. As compared to yesterday it must be gratifying to every progressive physician that physical therapy is no longer the Cinderella of Medicine. Today it occupies a respected place in the curricula of all outstanding medical schools and is practiced in a scientific manner in all reputable hospitals and sanatoria. As a corollary we must express thankfulness for the situation which arose through the aid accorded Physical Medicine in America by our great national association whose Council on Physical Therapy has by unusual and constant efforts aided in raising this branch to its present high standing.

The same spirit of gratitude prevails in our midst because of the good will and support by such eminent bodies as the American College of Surgeons, the American Hospital Association, and last but not least the American Congress of Physical Therapy. Thus now more than ever because of the clear skies over our hearths as compared to the dark clouds gathering over the homes of many of our foreign colleagues and over higher institutions of learning, Thanksgiving day assumes a particular meaning which while bringing joy to our hearts should also arouse our deep sympathy for the sadness felt by a goodly part of humanity and cause us to renew our pledge of loyalty and devotion to our country and our profession.

PRECISION IN ULTRAVIOLET THERAPY

Up to a decade ago ultraviolet therapy occupied the enviable status as the most accepted and least criticized of the practices sponsored by physical therapy and sanctioned by organized medicine. The paucity of clinical contributions of the present era is such a striking contrast to the rich and original labors that emanated from domestic and foreign sources of the period preceding it, that our very curiosity for this inexplicable change seeks some constructive answer to this radical departure in our scientific mood and fickle interest. The fact that this form of therapy has yielded imperishable and important clinical and scientific data and given modern medicine a new orientation of the value of ultraviolet radiation and its influence on the spasmophilic syndrome, the vitamin D activation and other important changes, may almost be regarded as a charge of present day indifference or inability properly to make use of this therapeutic agent. Perhaps one of the reasons for such a strange situation is to be found in the present tendency to accept new measures that have been advanced in an attractive manner at the expense of the old but tried procedures. Perhaps one may go farther and confess that Medicine like many other human activities is affected by temporary fashions holding the limelight for brief periods. This is particularly noticeable in the flood of new pharmaceuticals and organic products popularized by a roseate propaganda, while remedies that have stood the therapeutic test for centuries are being side-tracked during the ephemeral life of the former. What is said about pharmaceuticals holds good also to a similar degree with regard to physical therapeutic methods.

Ultraviolet radiation is a striking example of the changes in what may be called the fashions in the management of disease. Just as in electrotherapy the newer form of diathermy once overshadowed the older methods of producing

hyperemia until conservatism and experience resulted in a stricter determination of comparative values, just so is there today a reawakened interest in the more fundamental principles governing treatment by ultraviolet radiation. There can be no doubt that in the past this form of therapy has been administered rather empirically on ill-defined facts which naturally brought about certain failures and disappointments. Persistent recognition of the intrinsic value of ultraviolet radiation aroused the interest of a number of investigators for the purpose of clarifying the exact nature and action of this type of therapeutic irradiation. This is strikingly shown in the article by Saidman,[1] of France, published elsewhere in this issue, a contribution that merits most serious study by every physician. In this publication it is clearly shown that the haphazard manner in which ultraviolet has been administered in the past is bound in many instances not only to fail therapeutically but to aggravate certain conditions. The reason for this can be given in one word — dosage. This implies not only length of administration and distance of the generator from the irradiating field, but determination of the fluctuations in the source of light and the diversity of reactive powers of the human skin and subjacent structures. It has been pointed out what should be generally known that the sun itself is not a constant generator of actinic rays and this holds especially good for the various artificial sources available for ultraviolet therapy. Just as in the administration of potent drugs the dosage must be altered to meet individual needs, so physical measures must be administered on a biologic basis modified only by distinct pathologic indications.

So far as concerns ultraviolet therapy Saidman has demonstrated the need for an appliance which may be compared to the scales used in pharmacy. At the same time this appliance not only determines the intensity of the radiating source but conveys reliable information concerning the sensitivity of the patient's skin, so that with this and consideration of the pathologic processes to be subjected to heliotherapy, the physician is enabled to regulate the dosage expressed in various degrees of erythema reaction. Thus where indicated, one may obtain the merest superficial effects and vary this dose to the extent of a virtual escharotic effect wherever it may be needed. From this it is evident that ultraviolet radiation can and must be applied with precision which in turn presupposes not only suitable equipment but individualization in a biologic as well as pathologic sense. Under such conditions the therapeutic results in a large variety of indicated pathologic processes will be not only predictable but concretely effective. Past disappointments will be obviated and an old remedy added anew to our equipment capable of enhancing our clinical endeavor.

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SCIENCE, NEWS, COMMENTS

Clinical Conference New England Society of Physical Medicine

The New England Society of Physical Medicine announces a clinical conference to be held in Boston and Cambridge, Massachusetts, on November 8 to 10 inclusively. On Saturday or the last day of the conference the group will meet at the Massachusetts Institute of Technology for an all morning session where will be demonstrated the technical and latest advances in physico-technical research by members of that faculty. The official session will open on November 8, with the Presidential Address by Dr. *Henry A. Tadgell,* and will include illustrated lectures by Dr. *Harold E. Himwich* on Nitrogen Therapy in Schizophrenia; Observations on Human Refrigeration by Dr. *Temple Fay;* Symposium on Galvanism, Sinusoidalism and High Frequency therapy, and the like. The evening of November 8 will be devoted to a scientific presentation of interesting data by *Harold E. Edgerton,* Ph.D., on Stroboscopic Photography, and a lecture on the relationship of Modern Physics and the Modern Physician by *George H. Harrison,* Ph.D. The day of November 9th will be devoted to certain pertinent expositions including discussions on Phototherapy, the relationship of Pigments and Color of Living Human Skin, fever therapy and massage.

Madame Curie, Edison to Live Again on Screen

To join the successful epics of science that have paraded on the motion picture screen in recent months, there are other picturizations with a dominant scientific motif in the making.

Thousands have thrilled to "The Story of Louis Pasteur," "Alexander Graham Bell," and "Stanley and Livingston," which are historical photoplays as human and entertaining as those involving any cinema Queen who caused a camera to turn.

Now Greta Garbo will do "Madame Curie" and Spencer Tracy will portray "Thomas Edison" in Metro-Goldwyn-Mayer productions. These two pictures will tell stories of important scientists who have had major effects upon our world of today.

"The Story of Dr. Ehrlich" will star Edward G. Robinson for Warner Brothers, telling German accomplishments very different from those of today.

A picture telling of the discovery of anesthesia is also on the M-G-M list under the title "Triumph Over Pain," which, no doubt, will heighten the ether controversy between Georgia and Boston.

There are also rumors that Goldberger, fighter for the U. S. Public Health Service against pellagra, will live again on the screen. — *Science News Letter.*

New York Physical Therapy Society Meeting

A closed meeting of the New York Physical Therapy Society will be held at 8:30 P.M. on Friday, November 10, at the Liederkranz Club, 111 East 58th Street. The scientific program will consist of two papers:

1. Treatment of Hypertrichosis — Practical Demonstration, *M. H. Marton,* M.D. (by invitation).
2. The Use of the Galvanic Current as a Therapeutic Agent and its Rationale (Lantern Slides), *Victor Stoll,* D.D.S.

Following the scientific session there will take place an important executive meeting.

England's Scientific Work is Disorganized by War

Considerable disorganization of scientific work has occurred in England since the war began according to a survey issued by the Association of Scientific Workers, organized during the last war to protect the interests of scientists and those of science as a whole.

Many research scientists in British universities and industrial laboratories have lost their positions. Industries are dropping long term research. Many technical colleges are closed, along with their laboratories, especially in London.

The Ministry of Labor has compiled a Central Register of persons with scientific, professional and administrative qualifications, of 86,000 names, of which 7,000 could carry out scientific research. But there is no promise that any particular person registered will be pressed into service, either at the job he can do best or at all. The creation of a Ministry of Science, such as exists in France, to coordinate the scientific resources of the country is urged.

Significant suggestions: "Scientists should be utilized in scientific work. Organization and control should be in the hands of scientists. Machinery should be provided whereby scientists may exercise a right of criticism on purely scientific and technical matters. Scientific and technical as well as medical education should be maintained in time of war." All of which has lessons for the U. S. A. — *Science News Letter.*

Berkeley General Hospital Staff Program

Dr. William Herrick Northway, Director of Physical Therapy, Stanford University Medical School, was the guest speaker on the program of the staff meeting of the Berkeley, California, General Hospital, held October 13, 1939. His subject was "Evaluation of Physical Therapy Procedure." Other speakers and their presentations were: *Brooks P. Stephens,* M.D., "Treatment of Backache by Short Wave Diathermy — A Case Report"; *E. H. Benson,* M.D., "Practical Value of Electrocardiography."

British Nobelist Invents Substitute for "X-Ray" Eye

An ingenious substitute for x-ray eyes has been invented by the noted British scientist Prof. W. L. Bragg, Director of Cavendish Laboratory, Cambridge University.

The new device makes visible through a microscope the appearance of the invisible lattice arrangements of atoms in a crystal as they would be seen if the eye were sensitive to x-rays.

Prof. Bragg who, with his father Sir William Bragg, was a co-winner of the Nobel Prize in 1915 for his work in x-ray structure, uses holes drilled in a brass plate to make this feat possible.

First step is to take an x-ray diffraction picture of the crystal under study. The characteristic bright spots on this picture represent the diffraction scattering of x-rays from the rigidly-fixed atoms in the lattice of the crystal.

Next Prof. Bragg calculates the size and position of the holes in the brass plate which will give a similar diffraction pattern when viewed in ordinary light.

This specially-prepared brass plate is then placed between two lenses. At one lens' focus is placed a monochromatic light and the focus of the second lens falls on a pin which is observed with a microscope.

The diffraction of the light from the multiple holes in the brass plate results in a very realistic image of the crystal structure as if seen through the microscope. In effect, the observation is equivalent to having x-ray eyes.

Further research is seeking a way to place films over certain of the holes which will have a half-wavelength retardation to the light.

"If this can be found," Prof. Bragg states, "the method may prove to be of practical use in crystal analysis." — *Science News Letter.*

Sulfapyridine Is Tried As Tuberculosis Remedy

Sulfapyridine, chemical remedy that has been saving lives threatened by pneumonia, has been given to seven patients with tuberculosis in the hope that it would be equally useful as a remedy for this ailment. Hope that it might be was aroused by reports of previous use of the chemical for treating guinea pigs with tuberculosis. Unfortunately, the remedy failed to help any of the human patients, Drs. Stanton T. Allison and Robert Myers, of New York, report. (*Journal, American Medical Association,* Oct. 28.)

Both sulfapyridine and its chemical relative, sulfanilamide, are proving useful in treating another condition, the usually fatal blood poisoning due to staphylococcus infection. Cases in which these drugs are believed to have helped patients recover are reported in the same issue of the *A. M. A. Journal* by Drs. William A. Thornhill, Jr., Howard A. Swart and Clifton Reel, of Charleston, W. Va., and Samuel L. Goldberg and Allan Sachs of Chicago. — *Science News Letter.*

Domagk and Heymans Awarded Nobel Prize for Prontosil and Respiration Research

Thousands of people who have been snatched from the jaws of death by sulfanilamide or one of its healing chemical relatives will cheer the 1939 Nobel Prize award in medicine and physiology because it went to the man who is chiefly responsible for saving their lives. He is Dr. Gerhard Domagk, of the I. G. Farbenindustrie, Germany's famous chemical and dye combine.

Sulfanilamide, Prontosil, sulfapyridine, have become household words the world over. They are hailed as life-saving remedies for childbed fever and other deadly streptococcus infections, pneumonia, meningitis, gonorrhea and a host of other ailments. Not so well known is the name of the modest scientist who first told the world, on Feb. 15, 1935, that Prontosil, a relatively non-poisonous red dye, when given by mouth, protected mice from deadly streptococcus infection.

The dye itself was made by two other German scientists, Drs. Fritz Mietsch and Joseph Klarer, also of the I. G. Farbenindustrie. Probably a score of other chemists and medical scientists, including some Americans, worked with closely similar compounds, searching for a germ-killing chemical that could be given to cure sick people.

But Dr. Domagk's report of his work with mice started French and German and English and American doctors to giving it to their patients — women all but dying in childbirth; children delirious and desperately sick with meningitis; men, women and children gasping in an almost fatal struggle with the great killer, pneumonia.

The red dye Dr. Domagk used in his epochal experiments has been superseded by other, simpler and cheaper, because non-patentable, chemicals. But the life-saving work he started continues at an amazing and thrilling pace as the sulfanilamide group of chemical remedies conquers more and more of mankind's disease foes. Prof. C. Heymans of the University of Ghent, Belgium, was given the 1938 Nobel prize in physiology and medicine, postponed from last year, for discovery of one of the mechanisms that regulate respiration. Breathing is changed by a reflex mechanism when the nerve endings in the carotid sinus, located at the base of the skull, are stimulated by severe oxygen lack. — *Science News Letter.*

New Super-Microscope Perfected

A new and simplified electron microscope, suitable for use in research institutions, was perfected in Germany by the great electrical firm Siemens and Halske A. G. shortly before the outbreak of war, it has been learned in the United States.

Earlier models of this instrument, which uses streams of electrons in a vacuum tube to make visible minute structures and details not detectable by any microscope using beams of light, required the services of technicians specially trained in the handling of high vacuum and electrical instruments, which made operation too expensive for most research purposes. The new instrument obviates the necessity for these extra attendants. — *Science News Letter.*

Chemical Brain Pacemaker Aids Mental Disease Study

New understanding of paresis, or brain syphilis, one of mankind's major mental diseases, may result from the discovery that "breathing" of your brain cells sets the pace for your mental activity, Dr. Hudson Hoagland, Clark University physiologist, told the National Academy of Science at Brown University.

Electric waves from the brain itself signal to scientists the nature of this chemical control.

Each cell in your brain, as a byproduct of respiration, builds up electric potential, Dr. Hoagland explained. The cell walls have electric resistance. The electricity is discharged whenever the respiration process builds up potential and loads the capacities of the cell walls to their critical firing point. This electrical discharge forms the brain waves — electrical signals direct from the brain. Brain cell respiration creates the brain waves.

First constructing this theory from what was already known of other body cells, Dr. Hoagland put the idea to laboratory test by changing chemically the rate of cellular respiration and discovering that parallel changes occurred in the brain wave frequencies.

Thyroxin, powerful secretion of the thyroid and well-known speeder of the body processes, increases the frequencies of the brain waves. So also does the metabolic stimulant dinitrophenol.

Opposite effects in slowing the brain waves were obtained through lowering the blood sugar, thus depriving the brain of its principal fuel, and by markedly lowering the brain's oxygen consumption.

Study of the effects of temperature on brain wave frequencies has furnished information as to how one or the other of the links in the chemical chain that constitutes cortical cellular respiration may act as the pacemaker governing the brain waves, Dr. Hoagland said. This work has been applied specifically to the analysis of chemical pacemaker changes in advanced brain syphilis.

The effect of temperature on specific enzyme system involved in cellular respiration is also being studied by Dr. Hoagland. — *Science News Letter.*

Minor Foot Ailments Put on Urgent List in England

Ingrowing toenails, hammer toes and other minor foot maladies may get on the "urgent list" of cases admitted to London hospitals that are closed, because of war, to all non-urgent cases. The reason, given in the *Lancet*, (Sept. 30) English medical weekly: These minor foot troubles "become increasingly urgent as limitation of transport compels the population to resort to its legs." On the other hand, tonsil snatching among children may well be deferred until spring, it is suggested. Another transportation footnote: England is experiencing a back to the bicycle movement. Gasoline, petrol to Britishers, is scarcer and more costly. And it is easier to cycle two miles than to walk one. — *Science News Letter.*

Colchicine Solution Kills Plant Tumors

Colchicine, science's newest elixir to make plants produce giant offspring and go through other sudden and startling evolutionary changes, can also be the finger of death to the abnormal tissue growths known as plant tumors.

At the great U. S. Department of Agriculture laboratories near Beltsville, Md., Dr. Nellie A. Brown has been experimenting with colchicine solutions as a means for getting rid of plant tumors without killing the plants. Using a wide range of experimental material, including tomato, bean, wild tobacco, four-o'clock, Paris daisy and French marigold, she has demonstrated that simply brushing on a solution of the drug (usually of 2% strength) will kill nine-tenths or more of all tumors treated. Injecting an even weaker solution into the tumor tissue with a hypodermic needle produces similar results.

Plant tumors, unlike the animal growths which they resemble, are caused by a microscopically visible germ, known as *Bacterium tumefaciens*. Colchicine does not kill this germ. The effect of the drug seems to be directly on the tissues themselves. Colchicine appears to be deadly to the plant tumor cells, but not to healthy cells in the plant's normal tissues. — *Science News Letter.*

Female Sex Hormone Stimulates Male Opossums

Sex-physiological responses in male as well as female animals can be produced by the injection of the female sex hormone progesterone, it has been discovered by Drs. A. Bolliger and A. Carrodus of the University of Sydney, Australia. The two physiologists, who performed their experiments on young male Australian opossums, report their results in the science journal, *Nature*. (Oct. 14.) — *Science News Letter.*

Sensory Area Mapped

Science's inquiring finger can now point more accurately to the parts of the cortex of the brain that discriminate sensation, or feeling, in various parts of the body, an achievement reported by Dr. J. G. Dusser de Barenne of Yale University to the academicians.

Electrical brain waves, generated in the brain itself, signal the location and the extent of the area of the sensory cortex in a research technique devised by Dr. Dusser de Barenne in collaboration with Dr. W. S. McCulloch.

Precise localization of this area is possible because a little strychnine applied to the cortex of an anesthetized chimpanzee creates a special kind of brain wave, one with "spikes" of large and rapid voltage fluctuations.

The distribution of these spikes appearing in the electrogram of the sensory cortex is quite typical.

By this method it was found that the chimpanzee's sensory cortex is a very large region with major subdivisions serving sensation in the face, the arms and the legs separately. — *Science News Letter.*

Body Shape Hints at Death

The shape and proportions of a man's body, while he is still in good health and a long way from his funeral, give fairly definite indication of how and when he may be expected to die, Prof. Raymond Pearl and Dr. W. Edwin Moffett of the Johns Hopkins University reported.

Prof. Pearl made a study of the histories of 2332 men, all dead, representing the longest-lived and shortest-lived groups out of a much larger number. Information about their bodily constitution had been placed on file years before, when they were all in good health, with no indications of onset of the various diseases that finally killed them. He divided them into two classifications, long-lived and short-lived.

Among the results of his study, as reported to the Academy, were the following points:

Short-lived men who died of heart and kidney ailments were bigger around the body, in both chest and abdominal girth, than long-lived men who died of the same groups of diseases.

This condition was reversed in the case of men who later died of cancer and pneumonia: the skinny (asthenic) men were shorter-lived than the stouter (pyknic) type.

In those eventually dying from cancer and from diabetes the average body weight was also greater in the short-lived than in the long-lived group. The difference here, however, was too small to justify any very definite conclusions.

Height apparently had nothing to do with length of life. Talls and shorts were scattered at random through all the disease groups, among both long-lived and short-lived.

Pulse rate was more rapid among all groups of short-lived than it was among the long-lived groups.

Among the men who eventually died of heart disease, the longer-lived ones showed higher blood pressures than the shorter-lived, although the blood pressures of both groups were within normal range at the time they were taken. Analysis of other disease groups has not yet yielded definite data on this point. — *Science News Letter.*

Current Progress in Control of Arthritis

Many reports are appearing these days on ways of treating and controlling arthritis or rheumatism as it used to be called. This is a reflection of increased activity on the part of medical scientists who are studying the problem. The number of different measures reported to have given good results may, however, be confusing.

There is no doubt that progress is being made. Doctors no longer take a hopeless attitude about the condition, and all authorities on the subject urge arthritis sufferers to be optimistic. Cultivating a cheerful attitude, freeing the mind of worry and anxiety, are in fact now considered an important part of the treatment. This part, of course, is pretty much up to the patient.

Rest, both mental and physical, is very important. One authority, Dr. Walter Bauer, of Harvard Medical School, says that rest is probably as important in the treatment of rheumatoid arthritis as in the treatment of tuberculosis. Like tuberculosis patients, arthritis patients may need to be put to bed for complete rest, getting back to more normal life by slow stages.

So far as the various specific remedies or medicines reported to give good results are concerned, it must be remembered that arthritis patients are likely to have periods when they feel much better and others when they feel much worse. It is natural for them to credit the better periods to the last remedy tried and to think at last a "cure" has been found. The wise physician knows how to discount the effect of such periods of improvement and to wait for a much longer time before considering the remedy or treatment really effective.

If patients with arthritic or rheumatic tendencies are treated early, physicians say that the disease in many cases can be controlled. That is, it can be kept from going on to the stage of permanent joint damage, crippling and disability. — *Science News Letter.*

Aviation Medicine Laboratory Opened at Mayo Clinic

The Mayo Clinic, mecca for medical men and the ill, is adding to its tremendous research facilities an aviation medicine laboratory to study problems brought in the train of the air age.

A low-pressure tank simulating conditions at high altitudes, similar to the Army's tank at Wright Field, O., is now being installed in a new Laboratory for Metabolic Investigation and Aero-Medical Research. Both the Army and Navy are expected to cooperate with the Clinic's new research unit.

The laboratory will be in the charge of Dr. Walter M. Boothby, who with Drs. A. L. Bulbulian and W. Randolph Lovelace, II, invented the Clinic's most recent contribution to flying — the B.L.B. inhalator, an oxygen mask for use at high altitudes where the air is too thin to keep human beings functioning properly.

Effects of high altitude on the human body, and of rapid climbing and descent — both encountered in military flying, for example — are to be investigated by Dr. Boothby and his associates.

The effect of low atmospheric pressure on the human body, when oxygen is being taken through a mask, is also to be studied. At 18,000 feet, for example, the pressure is only seven and a half pounds per square inch instead of 15 pounds as at sea level. It is suspected that gases breathed in through the mask may diffuse more readily under the high altitude conditions.

Use of helium in a mixture with the oxygen to enable more rapid descent without producing earaches is also to be studied. Already tried with considerable success, helium's relieving effect is believed due to the fact that the light gas diffuses through the Eustachian tubes to the inside of the ears much more rapidly than air, with the result that pressure inside and outside the ear is equalized. It is this difference in pressure which pains the eardrums.

Dr. Lovelace is now en route to Europe on a two or three month trip financed by an I. William White traveling fellowship. He will study European aero-medical research activities. — *Science News Letter.*

Brain Waves Guide to Shock

Brain wave studies can furnish an exact guide to insulin shock treatment of the widespread mental sickness, schizophrenia, Dr. Harold E. Himwich, of Albany Medical College, Union University, reported.

During the treatment, he found, the changes in body chemistry, especially in the brain, and in the patient's symptoms fall into two phases which are paralleled by changes in the brain wave pattern. The best results of the treatment are associated with the second phase, when the patient becomes unconscious and when the alpha waves disappear from the brain wave records.

Brain wave records of the patients during treatment, it therefore appears, can be used to mark exactly the beginning of this therapeutically important part of the treatment. — *Science News Letter.*

Rabies Vaccine May Come From Eggs in Future

Vaccine for the treatment of rabies may in future be prepared from eggs instead of rabbits. This is suggested by results of culture experiments reported by Dr. James R. Dawson, Jr., of Vanderbilt University School of Medicine. (*Science*).

Dr. Dawson has succeeded in transmitting the virus of rabies to chicks and also in implanting it in incubating eggs. The embryos developed, and apparently would have hatched if they had not been sacrified for laboratory purposes. Examination of the central nervous systems of both chicks and unhatched embryos yielded positive evidence of the presence of the disease. — *Science News Letter.*

Poison Brings Immunity

Immunity on the part of the most essential portion of the kidney to the action of one of the most destructive of all known mineral poisons can be developed by subjecting the kidney to the action of an entirely different poison and letting it recover. This strange physiological effect, quite different from the way in which the body becomes immune to bacterial and other organic toxins, was described by Prof. William deB. Mac Nider of the University of North Carolina.

When the kidney of an animal is slightly injured by uranium nitrate, related Prof. MacNider, the cellular lining of the tubes that carry on the kidney's essential function is replaced by new cells of the original, normal pattern. Such cells are not resistant to a second poisoning with the same chemical compound.

If, however, the first dose of uranium nitrate is heavier, causing more severe injury, the self-repair that follows produces a different kind of lining cell in the tubes. The new cells are flatter in shape; and they are apparently physiologically tougher as well, for they cannot be injured by repeated doses of the uranium salt.

What is more remarkable, however, is the fact that they are also resistant to the action of bichloride of mercury, or corrosive sublimate, which is notorious for its selective and highly destructive effect on these particular cells in their normal state. In other words, the immunity of the repair cells produced by one poison is non-specific, but extends to another (and more severe) kind of poison. Other poisons to which the new cells have been found resistant are chloroform and alcohol.

Vascular Spasm in Experimental Gastric Ulcer — Nedzel

(Continued from page 686)

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THE STUDENT'S LIBRARY

TREATMENT IN GENERAL MEDICINE. Edited by *Hobart A. Reimann,* M.D., Magee Professor of Practice of Medicine and Clinical Medicine, Jefferson Medical College, Philadelphia, and Thirty-four Collaborators. With a Foreword by *Morris Fishbein,* M.D. In Three Volumes and Desk Index. Cloth. Pp. 2941 with 252 Illustrations. Price, $30.00. Philadelphia: F. A. Davis Company, 1939.

This encyclopedic work opens with a foreword by the eminent Editor of the Journal of the American Medical Association—Fishbein, and written in a vein characteristic of his well known iconoclastic style but at the same time exhibiting a scientific and constructive attitude in keeping with the progress of modern therapy. While he does not fail to impress one with the fact that growing experience in practice brings about a restriction to a few but tried remedies and methods, he nevertheelss places in bold relief the importance of the fundamentals in modern therapy. The opus proper represents a noteworthy collaboration by an outstanding group of American authorities on what promises to become recognized as the most important contribution on the therapeutics of general medicine. The scope of this work is so unusual that one might without exaggeration refer to it as three dimensional in quality. The contents include nearly 3000 pages of pertinent exposition by 34 distinguished specialists, whose labors not only have added clarity and depth to the evaluation of various therapeutic methods but have given that modern interpretation of pharmacal and physical therapeutics which will stimulate greater appreciation of the paramount role of therapy in the practice of medicine. That such an ambitious work must be the task of many collaborators is readily realized because of the significant and specialistic advances in medicine and particularly in physical therapy in recent years. Accordingly one early is impressed with the very balance of the exposition because it has devoted nearly one-fourth of the space to consideration of physical procedures and the remainder to medicinal therapy with frequent suggestions for combined measures. Examples of this broad viewpoint are found in Reimann's discussion of brucelliasis in which he recommends hyperpyrexia among other measures, and in Pelouze's interpretations of the thermal and hyperthermal values in certain urologic affections. This correlation of therapeutic agents is to be found in practically every chapter of the work which of course covers the realm of every system and disease recognized in medicine. Indeed, this work merits particular praise because it has not been held within the strict confines of pure therapeutics proper, but has expanded the text to guide the reader through the avenue of diagnostics as correlated with methods of treatment.

Of particular interest is that portion of this treatise dealing with physical procedures. This was written by one of the ablest and also the most critical exponent of its practice. Approximately one-quarter of this work or nearly 800 pages is devoted to this special field of therapeutics under the authorship or supervision of Coulter. The 16 voluminous chapters devoted to this topic cover among other considerations the physiologic, mechanical and clinical possibilities and limitations of radiant and electric heat and cold and their therapeutic indications. Coulter particularly exhibits high and critical scholarship in evaluating the relative merits of massage, manipulation and therapeutic exercise; posture and hydrogymnastics; low frequency and ultraviolet treatment; rest and spa therapy. This collaborator has managed to present one of the most lucid and constructive surveys of the advantages and usefulness of physical procedures in a manner more impressive than has appeared in any other recent publication. While stylistically his exposition may often appear as favoring the terse and abrupt method of instruction, one is certain to find his opinions supported by a rich personal background as well as by voluminous references that make his deductions assurances doubly sure. This author's attitude is one in which one fact outweighs a multiplicity of theories, and it is apparent that he would rather err in the direction of fact than commit himself to conclusions which lack the validity of proof. An author who follows the path of such verities is a leader to be endorsed and recommended to the profession.

LIFE AND LETTERS OF DR. WILLIAM BEAUMONT. By *Jesse S. Myer,* A.B., M.D., Late Assistant in Medicine in Washington University, St. Louis. With an Introduction by *Sir William Osler,* Bt. M.D., F.R.S., Late Regius Professor of Medicine in Oxford University, England. Cloth. Pp. 372. Price, $5.00. St. Louis: The C. V. Mosby Co. 1939.

The original issue of this important book appeared 27 years ago and since then many have found it impossible to purchase a copy. The present issue is a corrected and augmented reprint, to which has been added a 6-page evaluation of Beaumont's experiments by Dr. Andrew C. Ivy, the distinguished physiologist of Northwestern University. The story of Dr. Beaumont particularly with relation to his patient Alexis St. Martin is too well known to every American physician to need more than mention. Recently through the generosity and patriotism of John Wyeth and Brother, Inc. thousands of artistic reproductions of Dean Cornwell's masterly painting showing Beaumont obtaining gastric juice from his patient have been distributed to the profession. A colored reproduction of this painting is bound into the book. The late, lamented author has gone to much trouble in virtually reconstructing the life of the humble army surgeon who has risen to immortal fame by his own efforts, perseverance

under adverse conditions and by a zeal reminding one of his counterpart in the religious field—Savonarola. Only that Beaumont escaped the vengeance of bigotry and instead, as Dr. Ivy in his introductory evaluation so aptly says: "Beaumont was figuratively canonized as the patron saint of American Physiology," when the International Congress of Physiology in 1929 rendered his memory the greatest conceivable honor. As for the text proper, which is enhanced by very many photographs, facsimiles of documents, writings and the like, the story of Beaumont's life is vividly presented in chronologic sequence. Beaumont lived at a time when there were no medical schools in the modern sense, when aspirants for the practice of medicine trained under recognized practitioners and received certificates of proficiency as licenses to pursue their vocation with recognition by their ethical confreres. The book indirectly at least throws considerable light on the status of medicine of Beaumont's era, and this is perhaps no less interesting than the intimate biography of a fearless man gifted with the qualities essential for scientific research. The author rightly has avoided an apotheosis of his subject, and has depicted an intensely human figure, with ability to hate as well as love, but also the sturdy figure of a man ready to go to extremes in the interest of justice to his fellow men as well as to himself. Indeed, Beaumont did not hesitate to denounce his surgeon-general when this high and powerful functionary caused his subordinate difficulties out of jealousy of the international fame arising as a result of Beaumont's epochal research, and this in spite of his awareness that it would terminate his career in the Army. His success as a civil practitioner after his resignation from the military service shows that he was as conscientious and skilful as a physician and surgeon as he was as an observer of a then little understood physiologic function.

The organized profession of the State of Michigan has erected a monument on Mackinac Island in memory of his labors while Beaumont was serving at that military post. This is one of the shrines of American Medicine. The book under discussion is another monument rugged in grandeur and human in simplicity. Such is the splendor of Mr. Myer's literary achievement.

ERGEBNISSE DER PHYSIKALISCH-DIÄTETISCHEN THERAPIE. By Prof. Dr. *H. Lampert,* Bad Homburg v.d.H. Direktor des Univ.-Inst. für physikal Therapie, Frankfort a.M.; in association with Dr. *J. Kowarschik,* Hofrat, Wien; Prof. Dr. *W. Heupke,* Oberartzt an d. Med. Univ.-Poliklinik Frankfurt a.M.; Doz. Dr. *J. Kühnau,* Dir. des Stadt. Forsch.-Inst. für Bäderkunde u. Rheumaheilanst. Wiesbaden. Paper. Pp. 410 with 94 illustrations. Price, 25 RM. Dresden and Leipzig: Theodor Steinkopff, 1939.

Professor Lampert and his three associates (Kowarschik, Heupke and Kühnau) are to be warmly felicitated for as thought provoking and progressive an exposition as has recently come to the attention of the reviewer. Their contribution is the first of a series of volumes dealing with clinical physico-dietetic therapy. For long it has become apparent to certain groups of therapeutists that the subject of dietotherapy was both neglected and loosely classified in practice. Though recognized that diet plays an important role in medicine, it has only been in recent years that attempts at organizing and evaluating this important branch as part of our medical armamentarium has given it a position commensurate with its therapeutic importance. Likewise the fact that fundamentally it neither stems from the pharmacals and medicinals but rather is allied to physical measures in its broadest interpretations has been the reason why progressive students abroad have found it advisable to consider its problems a part of physical therapeutics. Accordingly this volume must be regarded as a stimulating and thought provoking discussion because it correlates the problems of physical and dietotherapy in a most scholarly and practical manner. The work is an excellent and informative exposition of the combined and independent administration of certain basic physical measures and foods. In the space of eleven crowded chapters written by the above named and other collaborators there are reviewed such pertinent problems as exercise in relation to sugar disease (Prof. Gerhardt Katch); hyperthermy and fever therapy by various methods; clinical fundamentals of sectional body baths (Rudolph Gruner); theory and practice of thalassotherapy; climatotherapy in its broadest aspect (Walter Amelung); present status of short wave therapy by the most authoritative and critical exponent of the Vienna school (Kowarschik); and other expositions associated with problems of dietotherapy in relation to insulism, hyperthyroidism, pregnancy, and the like. One cannot close this review without special mention of the splendid chapter contributed by Kowarschik who managed to pack into his discussion the most conservative, progressive and succint opinions possible within the physical limits devoted to its review. This and the topics mentioned above reflect Germanic scholarship at its best.

TREATMENT BY MANIPULATION. By *A. G. Timbrell Fisher,* M.C., M.B., C.H.B., F.R.C.S. (Eng.). Corresponding Member of the American Academy of Orthopedic Surgeons; Orthopedic Surgeon to the St. John Clinic and Institute of Physical Medicine and to the Arthritic Unit, St. Stephen's Hospital, etc. Third Edition. Cloth. Pp. 255 with 68 illustrations. Price, $3.75. New York: Paul B. Hoeber, Inc., Medical Department of Harper & Brothers, 1939.

The favorable reception of the preceding editions of this monograph was responsible in initiating greater interest in this subject, a practice long eschewed by the profession on account of unwarranted claims about its panaceic value by certain borderline practitioners. To the author belongs greatest credit for pointing out the orthodoxy of manipulative therapy and its favorable results not only as practiced by such famous predecessors as Hunter, Hilton, Thomas, Paget and others, but by an increasing number of orthopedic surgeons and himself. It is recalled that the previous edition emphasized the value of manipulation

on the basis of proper performance in suitable cases by surgeons or physicians qualified by practice and experience. This edition is an expansion of the author's continued studies on the subject, and embodies a conservative attitude and wider clinical latitude, due to wider experience. The text has been thoroughly revised, expanded by fifty-five extra pages and extensively rewritten. Several new chapters have been added, the most interesting being those that describe the present status of "the cult of Osteopathy" and "prevention of adhesions." The text proper is divided into twelve chapters as compared to ten in the previous edition. It presents a broad but critical review of the history of manipulative surgery and shows that its practice from the Hippocratean to the present era has been elaborated by trial and error methods by brilliant and courageous physicians. Lest that this form of manipulation be confused with the practices claimed by other opathies, Fisher stresses that manipulative therapy is not osteopathy. For instance, correction of a hip joint by suitable manipulation is for the purpose of improving or curing the pathologic process in the hip and not as the disciples of osteopathy imply, the cure of a diseased process elsewhere such as possibly, shingles or housemaid's knee. The author insists that the difference is as wide as fact is from theory and organized from disorganized knowledge. Chapters are devoted to discussion of the pathologic processes amenable to manipulation, and includes observations, directions, case reports and contraindications, all of which are as detailed as they are lucid. These also embrace such topics as prevention and diagnosis of adhesions; the general and special principles of treatment of the lower and upper extremities; the spine and sacroiliac joints, and the like. The text also includes suitable and clear illustrations and a detailed index. Few in the profession can afford to be without this practical volume.

HEART PATIENTS. Their Study and Care. By *S. Calvin Smith,* M.D., Sc.D. Formerly Special Heart Examiner for the Surgeon General's Office during the World War at home and abroad. Cloth. Price, $2.00. Pp. 166. Philadelphia: Lea & Febiger, 1939.

This monograph presents twenty years of the author's study and experience in the care of heart patients. The text is built around what the author calls "Cardiac Aphorisms." They are: "1. The heart is more sinned against than sinning. 2. Heart protests are not always heart disease. 3. The muscle is of more importance than the murmur. 4. Heart, mind and spirit are inseparable companions in treatment. 5. Effort, sustained and unremitting effort, of a physical, mental or emotional type, is the principal offender in depleting, disordering and disorganizing the heart and circulation." There are excellent classifications and descriptions of the seven varieties of the irregular pulse and the distinctions between angina pectoris and actual coronary artery occlusion. This little volume is readable, concise and direct, and is highly recommended to the general practitioner.

ANORDNUNG DER NORMALISIERTEN RÖNTGENAUFNAHMEN (DIRECTION FOR NORMALIZED ROENTGENOGRAMS). Bearbeitet von Dozent Dr. *Ernst G. Mayer,* mit einem Abschnitt Expositionsnormung von Ing. Dr. *Jaroslav Žakorsky.* Carton, XII-o, Pp. 112, with 189 sketches and an exposure slide rule. Price RM. 8. Vienna: Urban & Schwarzenberg, 1939.

This little book which was reviewed in the Archives some time ago, appears in its eighth, improved edition, though in the main the directions containing for placing the human body or parts of the body in standardized positions to obtain roentgen pictures has not been essentially changed. There is a foreword by the late Professor G. Holzknecht. The principal change from former editions lies therein that photographic illustrations have been replaced by line drawings, which more clearly show the various positions. The book is primarily intended for personnel corresponding to our technicians, but there are directions which specialists may well use for instructional purposes. A glossary, an index, and a slide rule in celluloid placed in a pocket complete the book, which to judge from the number of editions that have become necessary within a comparatively short period, enjoys considerable popularity in x-ray departments of hospitals in German speaking countries.

SURFACE ANATOMY. By *W. E. Roberts,* M.R.C.S., L.R.C.P., Hon. Demonstrator of Anatomy, University of Sydney. Foreword by *A. N. Burkitt,* M.B., B.Sc., Professor of Anatomy, University of Sydney. Cloth. Pp. 93 with 40 illustrations. Price, 7s. 6d. Sydney, Australia: Angus & Robertson, Ltd., 1937.

This excellent work on surgical anatomy has two distinguishing features. Practically every illustration shows the surface markings upon a living model, and the complete text description of each figure is printed upon a single page, placed opposite the figure. These features render the study of surface anatomy more easy and thus facilitate the work of the student. It can be recommended to physicians as a guide to surgical anatomy.

ELECTRON OPTICS. Theoretical and Practical. By *L. M. Myers,* Research Department, Marconi's Western Telegraphic Company, Ltd. Pp. 618 with 379 illustrations. Price, $12.00. New York: D. Van Nostrand Company, Inc., 1939.

There is perhaps no branch of experimental science which to date has not been influenced by the rapid development of electronics. Devices using electronic tubes in some form or another as a means of refined tools of research are nowadays very common in experimental medicine. Especially is this obvious in research laboratories devoted to biophysics for electrophysiology where cathode ray tubes are being used for the investigation of such phenomena as action potentials, electrocardiograms, encephalograms and so on. The devices used for investigative purposes are not always simple. The

reliability of the obtained results largely depends on the intelligent use and understanding of the behavior of the instruments. It is therefore in most instances impossible to avoid that the physician interested in these special fields either acquire himself the necessary physical knowledge or secure the collaboration of a physicist thoroughly familiar with the subject. It is from this point of view that such a highly technical book as that of Dr. Myers is of interest to physicians specializing in physical therapy. The author deals with the theoretical principles of electron optics which is most important for the understanding and design of cathode ray tubes used in research and associated with the practical fields of television. The exposition is, however, so profusely interwoven with mathematical formulae that the average reader will be unable to follow the author in every chapter. The electrical phenomena are compared with the more well known principles in optics, so that one can much more easily follow the necessary deductions as compared to the technicalities regarding electrical phenomena. One of the most interesting chapters is that which deals with electronic microscopy. It would lead us too far afield to discuss in detail the entire subject of this excellent book, but physicists associated with medical research laboratories interested in this subject will certainly find this new contribution a most valuable and dependable reference book on cathode ray tubes.

SURGICAL TREATMENT OF HAND AND FOREARM INFECTIONS. By *A. C. J. Brickel*, A.B., M.D., Departments of Anatomy and Surgery Western Reserve University. Cloth. Pp. 300 with 166 illustrations, 25 plates and 10 colored plates. Price, $7.50. St. Louis: The C. V. Mosby Company. 1939.

Since the appearance of Kanavel's classic work on this subject, the ever increasing mutilations of the upper extremity in the industrial world and the frequency of non-traumatic infections of the fingers and arms have raised problems which still await perfect solution. The present volume comes as near such an ideal as research and clinical experience can attain. The text proper leaves little to be desired from the standpoint of thoroughness. Within seven chapters the author has covered the anatomy, radiopaque injections of the hand spaces, anesthesia, physical therapy, the principles of incisions and all known types of regional infection and their management. Of especial importance is a warning to caution patients of possible imperfect results and to avoid certain common measures which may aggravate existing conditions. One finds also valuable hints about the legal rights of the injured and the proper relation between them and the surgeon.

In a brief section the author enumerates all of the physical measures essential for the restoration of function. While no attempt has been made to present technics, this section on physical therapy contains a number of valuable suggestions and hints for proper dosage and application. Bier's passive hyperemia, which in the past has proved effective in certain types, notably tuberculous infections is not discussed. The anatomic and pathologic drawings and photographic illustrations are superb, and the format is in keeping with the importance of the text. The work, in short, is a most valuable addition to the literature and should be studied with care by all who are called upon to treat hand infections resulting from injury or certain systemic causes.

A PHOTOGRAPHIC ATLAS FOR X-RAY THERAPY. By *Ira I. Kaplan*, B.S., M.D., Director, Radiation Therapy Department, Bellevue Hospital; Clinical Professor of Surgery, New York University Medical College, etc. and *Sidney Rubenfeld*, B.S., M.D., Associate Visiting Radiation Therapist, Bellevue Hospital; Instructor in Surgery, New York University Medical College, etc. Cloth. Pp. 120, with 55 illustrations. Price $4.00. Chicago: The Year Book Publishers, Inc., 1939.

The excellence of this atlas is supported by such rare artistry in the form of black and white schematized half-tone drawings and luminous type that were it not for the originality and importance of the descriptive text this volume could deservedly justify its *raison d'être* on the basis of its esthetic beauty and anatomic exactness. The authors and the publishers are to be warmly felicitated on a contribution as original as it is rare, and to them is due the assurance that it will long maintain its leadership in a field which has for some time been in need of such a well balanced text. This descriptive atlas presents a series of properly organized illustrations and guidance in radiologic technic by experienced teachers of radiation therapy, pictures that are anatomically in exact position as topographic landmarks for portal exposures. The explanations for therapy are succinct and lucid and follow the abbreviated or outlined style of exposition. The 55 excellent full plate drawings illustrate the proper setting for irradiation of the different internal organs. Each drawing conveys the information of the visible anatomic landmarks, the palpable internal landmarks, the internal parts to be irradiated, and lastly the exact placement of the treatment-cone with respect to these landmarks. This beautiful and instructive work is an indispensable reference book for every institution and office where x-ray is undertaken, prescribed or even considered.

INTERNATIONAL ABSTRACTS

Severe Skin and General Reaction Following the Administration of Sulfapyridine and Exposure to Ultraviolet Light. Rupert Hallam.

Brit. M. J. **4080**:559 (March 18) 1939.

It has long been recognized that certain drugs, among which are sulphonal, veronal, and luminal, have the capacity, when taken orally, to render human skin sensitive to the effects of actinic light, but it is doubtful whether the administration in medicinal doses has given rise to any untoward changes in the skin following exposure to light. The proclivity to photosensitization, however, is of much greater significance since the introduction of the new but already widely used group of derivatives of p-aminobenezenesulphonamide (sulfanilamide). This group contains both dyes such as prontosil rubrum, rubiazol, the colorless compounds sulfanilamide itself, (prontosil album), proseptasine, soluseptasine, uleron, and also the most recently introduced M & B 693 (2-sulphanilyl-amidopyridine), a compound of value in the treatment of pneumonia, gonorrhoea, and other infections.

Taking into consideration the small dose of M & B 693 in the foregoing case and the onset of the symptoms shortly after the exposure to ultraviolet light, there appear to be grounds for assuming that this man's skin was photosensitized by some chemical reaction following the administration of M & B 693, and that the exposure to a moderate dose of ultraviolet light precipitated the onset of an intense reaction, which at one time gave rise to considerable anxiety. Unless further clinical and experimental experience proves this contention to be erroneous, it is desirable that every prescriber of M & B 693 should be aware of this potentiality, and every patient be expressly warned of the danger of exposure to strong sunlight or any form of artificial sunlight during the time he is taking the remedy.

Short Wave in Rheumatism. A. H. Johansen.

Ugesk. f. laeger **101**:291 (March 9) 1939.

Johansen states that short wave therapy has been carried out at the Finsen Institute during the last four years. It has given excellent results in lumbago, ischialgia and rheumatism of the muscles. It has proved useless in spondylitis deformans and osteo-arthritis, with only occasionally a purely palliative effect. In chronic disorders of the joints the method by itself has sufficed only in rare cases, although the palliative results are not to be underrated, but its great value as an integral part of the general treatment of these disorders is emphasized. The results of short wave therapy in twenty-two cases of lumbago, eighteen of ischialgia, forty of rheumatism of the muscles, eight of infectious arthritis and twenty-six of chronic primary progressive polyarthritis are tabulated. — [J. A. M. A. **113**:188 (July 8) 1939.]

Electrolyte Balances During Artificial Fever With Special Reference to Loss Through the Skin. E. Henry Keutmann, Samuel H. Bassett, and Stafford L. Warren.

J. Clin. Invest. **18**:239 (March) 1939.

The purpose of this investigation was to study the electrolyte and fluid loss through sweating during sustained artificial fever therapy. Complete data are difficult to obtain, yet a sufficient number of results were observed from four patients examined to prove of value to the general problem of water and electrolyte balance. The situation of the patient who is placed in a heated cabinet in order that artificial fever may be produced, is analogous in many respects to that of the individual whose body is exposed to the heat of the desert or to the hot atmospheres of certain industries, except that during the artificially induced fever the patient does not breathe heated air. When the temperature of the external environment exceeds that of the body, dissipation of heat is accomplished by evaporation of water from the skin and lungs. The body resists the attempt to raise its temperature above normal, and physiologic mechanisms for thermal regulation are brought into action. The superficial vessels dilate; the flow of blood to the skin is increased; the sweat glands become intensely active, and the respirations become deeper and more frequent. Perhaps the most serious consequences of these regulatory efforts are the rapid losses of salt and water through sweating.

Role of Sweat as a Fungicide, With Special Reference to Use of Constituents of Sweat in the Therapy of Fungous Infections. S. M. Peck; H. Rosenfeld; W. Liefer, and W. Bierman.

Arch. Dermat. & Syph. **39**:126 (Jan.) 1939.

Peck and his collaborators studied the fungicidal power of human sweat and of its individual components. When this fungicidal power was established, an attempt was made to treat fungous infections by topical application of some of the ingredients, singly and in combination. The importance of such therapy does not lie in the fact that new and startling fungicidal agents are presented but in the fact that a more nearly physiologic approach to the therapy of fungous infections is proposed. According to their experiments, alkalized thermal sweat had no fungistatic property until concentrated. Dilute heat sweat obtained from a Negro boy and not alkalized was fungicidal at a p_H below 7. Analysis of samples

of sweat revealed the presence of propionic, acetic, caprylic (caprou) and ascorbic acids, as well as traces of urea and uric acid. The authors state that artificial sweat made according to their analysis and to those reported in the literature was fungicidal. The role of lactic acid in the fungicidal action of the sweat was demonstrated. Sebum found in the contents of sebaceous cysts was neither fungistatic nor fungicidal. The fungicidal properties of sweat are due to its content of acetic, propionic, capronic, caprylic, lactic and ascorbic acid. These substances must be present in the proper concentration to exert a fungistatic or fungicidal effect. There seems to be a relation between the localization of fungous infection and the distribution of sweat on the surface of the body. Areas which are exposed to the greatest concentration of sweat seem to have less tendency to fungous infection. Topical applications of ingredients of sweat, such as mixtures of lactic, propionic, butyric and ascorbic acid in proper concentrations, have proved valuable in the treatment of fungous infections. — [Abstr. J. A. M. A. **112**:1194 (March 25) 1939.]

Exercise in the Sympathectomized Cat. Robert Hodes.

Am. J. Physiol. **126**:171 (May 1) 1939.

The evidence that the sympathetic division of the autonomic nervous system plays a significant role in the cat's adjustment to physical exertion is threefold. 1. Exclusion of sympathetic nerve impulses results in a marked impairment of the animal's working ability. 2. This deficiency is present for as long as three months, provided there is no sympathetic regeneration. When there is evidence that regrowth has occurred the animal partially regains its ability to run in a treadmill. 3. Injection of adrenalin in small doses may markedly improve the sympathectomized cat's performance.

The defects of sympathectomized cats when required to run are in striking contrast to the dog's unimpaired capacity for vigorous, spontaneous and long-continued activity which Brouha, Cannon and Dill (1936) have reported. Possible reasons for this vastly different behavior of the two species may now be considered. Evidence has been adduced that the cat's vagus trunk contains cardio-accelerator fibers. Jourdan and Nowak (1934) demonstrated such fibers in the dog, and Brouha, Cannon and Dill (1936) proved them to be partially responsible for the cardiac acceleration of the sympathectomized dog during exercise. Apparently the species difference cannot be explained on the basis of the cardiac acceleration attainable, since in both cats and dogs the maximal h.r. is reduced about 30 per cent after the operation. Sometimes sympathectomized cats faint if they become greatly excited and struggle, an observation first reported by Freeman and Rosenblueth (1931). The workers recorded a marked fall of the blood pressure of sympathectomized cats concomitant with struggling. On the other hand, only a slight and transient blood pressure reduction occurs when dogs deprived of their sympathico-adrenal systems exert energetic movements (Pinkston, Partington and Rosenblueth, 1936). This difference in the vascular response of the two species during vigorous activity may at least partially explain the dissimilar findings in their respective capacities for labor after sympathectomy. Further, McDonough (1939) points out that the sympathectomized dog's ability to endure unfavorable environmental conditions may be attributed "to the numerous accessory physiological devices not under sympathetic control, that are possessed by the dog as a running animal — larger lung and heart per kilogram of body weight, greater blood volume, higher hemoglobin content, abundant salivary flow and a long tongue for heat loss."

The beneficial action which adrenalin may have in dispelling fatigue is confirmatory of the work of Campos, Cannon, Lundin and Walker (1929); but the present study offers no further clue as to the possible mechanism of the drug's effectiveness which these authors discuss.

Tuberculosis of Tendons, Tendon Sheaths, and Bursas About the Head. Frank N. Potts.

New York State J. Med. **39**:983 (May 15) 1939.

Much can be done for tuberculosis of the tendon sheaths and bursa. It responds both to conservative methods and to radical surgical therapy. A case uncomplicated by an open lesion can be properly splinted, the hand and fingers kept at rest for a long period, and good results obtained. This procedure has been carried out for many years with satisfaction. The swelling subsides, the symptoms disappear, and the function to a large extent is recovered. It is a long, trying procedure. The tendons become involved in scar tissue and there is lost motion at the wrist and in the fingers, which necessitates many months of treatment to overcome. Careful attention to a primary lesion is necessary. Even under the most careful hygiene the lesion may progress. We are still dealing with tuberculosis and there never has been a substitute for physiologic rest. Efforts at surgical intervention have their place, as well as sunlight and artificial ultraviolet radiation.

Conservative Management of the Sinuses. J. W. Jervey, Jr.

South. Med. J. **32**:278 (March) 1939.

Local physical remedies have to do chiefly with suction and the application of heat. Many are opposed to suction in any form except by a cannula placed directly in the secretions to be removed. Certainly mass suction promotes congestion and edema, yet in some instances, where properly used, the syphon douche has proven its usefulness. Hot applications are most comforting in subacute cases. The infra-red lamp will be found helpful. Diathermy is said to reduce the number of bacteria, due to its bacteriostatic action. The value of x-ray has not been definitely proven to my satisfaction.

General medical treatment is unquestionably important. Sulfanilamide should be used if the condition is complicated by a streptococcus infection. Glandular therapy, especially the use of thyroid extract, has its indication. Climate probably is a factor only in the severity of sinus infection which is endemic throughout most of the civilized world.

The Significance of Peripheral Circulatory Disturbances for the Development of Osteo-Arthritis. David H. Kling.

Am. J. Med. Sci. **197**:358 (March) 1939.

The joints and blood vessels of the lower extremities, amputated for gangrene in 3 cases of thromboangiitis obliterans and in 10 cases of arteriosclerosis were studied. In both groups the vessels of the extremity showed advanced lesions. The synovial vessels were normal or only moderately affected in the cases of arteriosclerosis. In thromboangiitis obliterans the synovial vessels were found to be more frequently involved. The synovial membrane was normal, except for localized hypertrophy in two cases of the arteriosclerotic group. One case of thromboangiitis obliterans showed subacute synovitis of ankle and knee joints. Venous congestion of the synovial membrane was found in one case. Pronounced osteoarthritis was present in only two cases. Slight erosions of the articular cartilage were found in all patients past 40 years. The incidence and extent of these changes correspond to that usually found in a similar age group with normal blood vessels. On the basis of these findings the vascular theory of osteoarthritis is contradicted.

On the other hand, articular cartilage is damaged by wear and tear of use, and by normal pressure, and weight-bearing. Age, mechanical and traumatic factors, therefore, play an important role in the development of osteoarthritis. Constitutional inferiority of bone and cartilage or malformations of the bearing surfaces are apt to hasten and accentuate the development of osteoarthritis. Cartilage and bone growth are profoundly influenced especially by the hypophysis. Imbalance and dysfunction of the endocrine system is advanced age and especially at the menopause explain the onset of osteoarthritis and the prevalence in women past forty years of age. Bone has a higher metabolic rate and nutritional requirements, and is therefore susceptible to vascular disturbances. Atrophy decalcification and, in extreme cases, also necrosis and absorption occur in arteriosclerosis, thromboangiitis obliterans, Raynaud's disease and scleroderma. Bone hypertrophy of the end phalanges, due to venous congestion, is quite common in chronic heart and lung diseases. Clinical evidence also shows that vascular disturbance is only a secondary factor in osteoarthritis. Organic or functional changes of the blood vessels, blood pressure, and flow, and change in the skin capillaries are not much more frequently found and are not more pronounced than in patients of a corresponding age group which do not suffer from osteoarthritis. Therapeutic measures to augment the circulation in osteoarthritis are not directed against the primary cause; therefore, the effect is mostly transitory and only symptomatic. Protection of the joint by rest, correction of abnormal pressure, weight-bearing and, as a last resort, operative procedures which eliminate or decrease motion, offer a more efficient way of prevention and arrest of the degeneration of articular cartilages.

Estrogen Therapy and Photosensitivity. A. H. Lancaster.

South. Med. J. **32**:451 (May) 1939.

In studying a group of six female patients affected with photogenic dermatitis Lancaster eliminated any of the known photosensitizing drugs by careful investigation. There was a definite history of menstrual disturbance preceding the dermatitis, but in two this affection preceded the menstrual disturbance two and three years respectively. Most of the married patients gave a history of sterility, others gave a clinical history of symptoms long recognized as being associated with estrogenic deficiency and these symptoms were benefited by hormones. Improvement in the dermatitis and menstrual disturbance appear to parallel each other. In the younger adults in whom the menstrual disturbance preceded lowered tolerance to sunlight, correction of the menstrual disturbance has been accompanied by a permanent restoration of tolerance to sunlight. But in those in whom the dermatitis preceded the menstrual disturbance it has been necessary to give injections at variable intervals, depending on the appearance of the dermatitis. Even though endocrine therapy is mostly speculative, the author is of the opinion that there is a definite estrogenic deficiency in female patients suffering with photogenic dermatitis. He is thoroughly convinced that estrogen has a definite place in the management of sunlight eruptions in women and that, judiciously used, it will aid in the solution and management of the allergic patient.—[J. A. M. A. **113**:180 (July 8) 1939.]

Sacro-Iliac Strain. A. Lawrence Abel.

Brit. Med. J. **4082**:683 (April 1) 1939.

The patient lies upon a firm low operating table or couch and as soon as he is fully anaesthetized, rotatory manipulation of the pelvis of the affected side and of the opposite side is carried out, and forced flexion and extension of the lumbar spine performed. The patient lies upon his back and the surgeon raises the leg of the affected side and passes it across the opposite limb in such a way as to cause the pelvis to rotate away from him, and until the leg and foot hang over the table on the opposite side. His other hand steadies the patient's shoulder on the affected side and keeps it so far as possible resting on the table throughout the manipulation — that is to say, the supine position is maintained on the shoulder girdle as far as possible and the prone position as far as may be adopted for the pelvis. Firm pressure is then put upon the posterior aspect of the crest of the ilium and a sudden wrenching movement is made to try and turn the innominate

bone of the affected side forwards away from the surgeon towards the table, all the time keeping the shoulder of the affected side as much in the supine position as is possible. In a large proportion of cases a crack or crunching noise is clearly audible; this, however, is not essential and many cases obtain dramatic relief when no sound has been produced.

The patient's pelvis is now rotated in the opposite direction, and with the surgeon standing on the other side of the table a similar forcible movement is carried out upon the innominate bone on the less affected or unaffected side. Several forceful jerks are made upon the iliac crest so as to be certain that the sacro-iliac joint is fully mobilized. The patient is then placed in the supine position and the thighs and knees are forcibly flexed upon the trunk, so that the fullest possible flexion of the whole spine is obtained. Lastly, the patient is placed in the prone position and, with one arm of the manipulator resting beneath the patient's knees and the other in the small of his back, the spine is forcibly extended as much as possible.

It has been learned from experience that manipulation of the more severe grades of the condition may cause an acute exacerbation of the pain, with consequent increase of the disability. These cases are best treated, therefore, with a sacro iliac belt. According to Abel, there is only one type of sacro iliac belt which is really efficient, and that is the Camp sacro iliac support.

The author feels that electrotherapeutic measures in relation to this type of strain are of little value, though in the more severe types radiant heat, medical diathermy, and infra-red irradiation have sometimes played an alleviating part. Radical surgical operation is indicated only in those cases which are resistant to the two foregoing methods.

Influence of Exercise on Blood Pressure, Pulse Rate, and Coronary Blood Flow of the Dog. Hiram E. Essex, J. F. Herrick, Edward J. Baldes, and Frank C. Mann.

Am. J. Physiol. **125**:614 (March 1) 1939.

A series of experiments has been done on control dogs and dogs in which *thermostromuhr* (thermal flow time) units had been previously applied to the coronary arteries in an effort to determine the effect of exercise on the pulse rate, blood pressure and coronary blood flow. Each animal had been accustomed to perform work at different rates on a treadmill. Preliminary experiments demonstrated that the presence of the coronary thermal flow period unit had no significant effect on the electrocardiograms or blood pressure of the animals studied.

Successive increases in the rate of work produced additional rises in blood pressure which were roughly proportional to the rate of work for the individual animals in both the control and experimental groups. As a given rate of work continued the behavior of the blood pressure varied from animal to animal. In certain experiments the blood pressure reached a maximal level early and declined, in some it remained near the maximum, while in others it continued to augment throughout the period of exercise. The pulse rate of the dog is a less reliable index of the rate of work than the blood pressure. The maximal pulse rate with low rates of work may be as great initially as with higher rates of work. Simultaneous records of pulse rate, blood pressure and coronary blood flow were made during exercise. The marked increases and decreases of coronary blood flow observed with various increments and decrements of work could not be satisfactorily accounted for by changes in blood pressure alone. The change in pulse rate with exercise was usually a better criterion than the blood pressure of changes in coronary blood flow. The evidence indicates other influences as important as blood pressure in augmenting coronary blood flow when a trained dog is given successive increments in the rate of work.

Pigmented Nevi. Jacques W. Maliniac.

Am. J. Surg. **45**:507 (Sept.) 1939.

Proper mental hygiene requires that all those affected by this extensive skin blemish should be treated at an early age. Replacement of the involved skin areas by plastic procedures is the most effective means of repair. Excision of the circumscribed nevus is the simplest method available. Wide undermining of the surrounding skin is sometimes necessary to bring about closure without undue tension. If necessary, repeated partial excisions can be undertaken. After each excision the area of involvement is reduced, aided by the natural elasticity of the skin. Repeated excisions finally eradicate the pathologic process.

Treatment of Pelvic Inflammation by Iontophoresis of a Choline Compound. Adolph Jacoby.

Am. J. Obst. & Gynec. **37**:272 (Feb.) 1939.

In a previous communication, the underlying principles upon which the treatment of pelvic inflammatory conditions by iontophoresis is based, together with the technic and the results obtained in 10 patients, were described. It is evident that whenever the pelvis shows an exudative inflammatory process, prompt recession and restoration to normal occurs following treatment by iontophoresis of acetyl-beta-methylcholine-chloride. On the other hand, if the process includes organized inflammatory products or definite pathologic tissue alteration, such as cysts, or tumors, no change is produced. It is reasonable, therefore, to conclude that in the method of treatment by iontophoresis of acetyl-beta-methylcholine-chloride, we have a therapeutic means of differential diagnosis of pelvic masses, as well as an efficient method for the rapid cure of pelvic exudative inflammation in any stage.